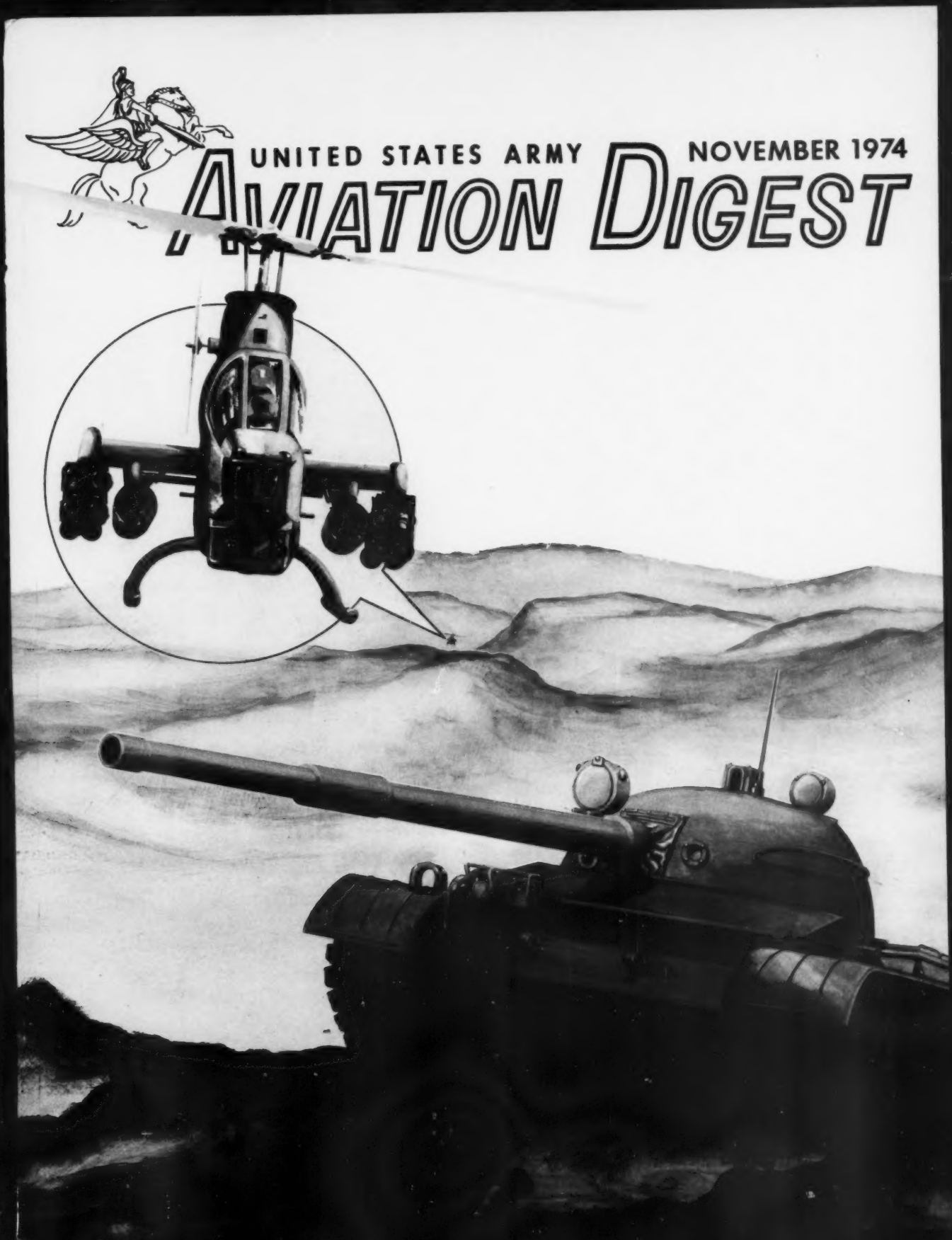
UNITED STATES ARMY
NOVEMBER 1974
AVIATION DIGEST

UNITED STATES ARMY AVIATION DIGEST

NOVEMBER 1974 VOLUME 20 NUMBER 11

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VANGUARD OF FREEDOM
BICENTENNIAL 1775-1975
UNITED STATES ARMY

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ABOUT THE COVER

Again this month the DIGEST emphasizes that training and tactics are inseparable. The cover depicts the combat dimension of the training-tactics theme. Articles in this issue accent the training aspects, stressing that combat effectiveness is greatly dependent on quality training. Cover by M. Dorough

The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine and other related data.

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Articles, photos, and items of interest on Army aviation are invited. Direct communication is authorized to: Editor, U. S. Army Aviation Digest, Fort Rucker, AL 36360.

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TACTICS TRAINING outlook

WHERE WE ARE—

Major General William J. Maddox
Commander, U. S. Army Aviation Center

TODAY ARMY AVIATION training doctrine is being overhauled to prepare our airmobile forces for combat operations in a mid-intensity war. But, the task of describing the end results of today's training program — aviation employment in a mid-intensity war— is difficult for two reasons: First, the term *mid-intensity* is misleading; it tends to conceal both the lethality of the battlefield and the intensity of the combat. Second, because of our increasing [illegible] ness of this lethality aviation doctrine is in a state of flux.

Being in a state of flux is hardly negative if you know which way to go. The airmobile potential of Army aviation is readily apparent —and so is the route to take.

Two recent wars have dramatically affected both *where we are* and *where we are going*. The first war, of course, was in the Republic of Vietnam. During 11 years of fighting Army aviation generated some 16.7 million combat flying hours. We began the war with a predominantly fixed wing force, oriented toward command, liaison and resupply functions. We evolved

WHERE WE ARE GOING

Photos by [illegible]

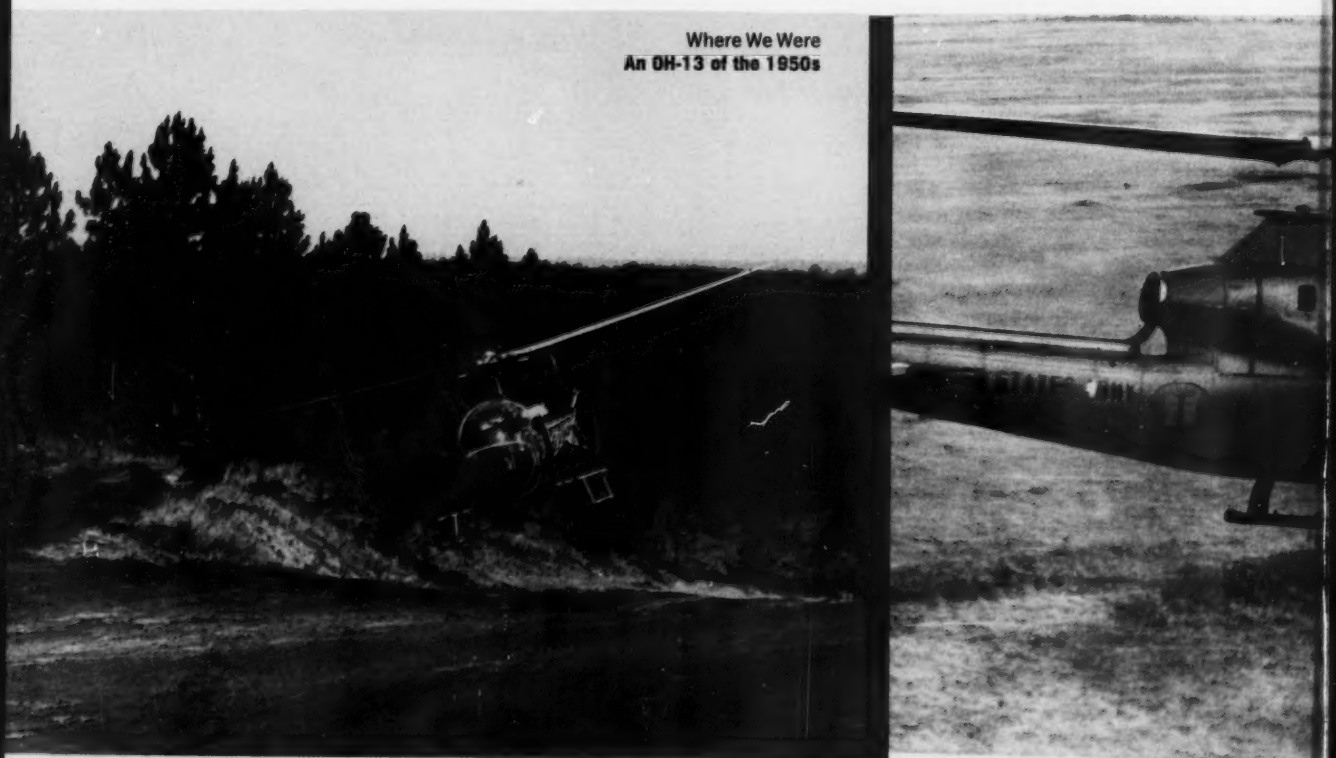
to a force composed of 90 percent helicopters, most of which served as true combat vehicles. With them we proved the concept of airmobility as envisioned by the Army Tactical Mobility Requirements Board, better known as Howze Board.

Army aviation has flown 16.7 million combat hours during 11 years of fighting

Indeed, in Vietnam the helicopter became the key to success in most combat actions. While action was often heavy, we did not generally operate in a high air defense threat environment. However, during Lamson 719 and the 1972 North Vietnamese offensive, we encountered increasingly sophisticated air defense weapons. Only a relatively few aviators remained incountry to share this experience. At the close of the war, we demonstrated the capability of the aerial TOW (Tube launched, Optically tracked, Wire guided) missile in the antitank role. Thus, it was the requirements and experience of Vietnam that have determined, for the most part, our current capabilities and force structure.

The October 1973 Middle East war gave a clearer picture of the mid-intensity battlefield

In October 1973 a short, intense war occurred in the Middle East. Although the helicopter was not used extensively by either side, the war provided us a clearer picture of the mid-intensity battlefield. It described the environment within which our aviation systems must operate:



Where We Were
An OH-13 of the 1950s

• First, highly sophisticated Soviet equipment was used in vast quantities with heavy emphasis on anti-aircraft and antiarmor weapons.

• Second, the Arabs were equipped for extensive nighttime operations. This capability was not fully exploited by the Arabs, but the threat was there.

• Third, extensive electronic warfare capabilities were demonstrated.

• Fourth, well-trained soldiers and combined arms tactics paid off handsomely and are considered to have "made the difference" once the Israeli forces were fully mobilized and committed.

Keeping the contrasting wars of Vietnam and the Middle East in mind, where do we in aviation stand today? Since the last Army Aviation Program Review in December 1972, we have assumed a post-Vietnam deployment posture. We have one airmobile division at Fort Campbell, KY, and a skeleton air cavalry combat brigade at Fort Hood, TX. The Tricap Division is returning to an armored configuration.

To help further clarify *where we are*, it is necessary to consider the following aspects of Army aviation as it exists today:

• Aviation organizations are decentralized to the level where the tactical ground commander has a fulltime need. Training responsibilities also have been decentralized.

• Proponency for aviation organizations and aircraft has been decentralized to the various branch centers as listed in the box on page 21.

• There is a body of applicable training literature, but it is incomplete, overly parochial and based primarily on our Vietnam experience.

• The first steps have been taken for integrating Army and Air Force training on the various close air support and firepower means available. The U. S. Army Training and Doctrine Command (TRADOC) has established joint working committees with the Tactical Air Command (TAC). Recently, TRADOC and TAC published a draft manual on airspace management that was endorsed by the Air Force chief of staff, General George S. Brown, and General Frederick C. Weyand, as the Army vice chief.

• With the exception of attack helicopters and utility fixed wing transportation, the Reserve Components are equipped with first line aircraft. The Army, as a whole, is at or near its authorized acquisition objective except for these two types of aircraft.

Continued on page 21

Where We Are
An AH-1 HueyCobra of the 1960s and 70s

Where We Are Going
Advanced attack helicopter mockups

Aviation Training In FORSCOM

Readers will learn of FORSCOM (U. S. Army Forces Command) efforts to accelerate the state of readiness of aviation units and the priorities established for training and equipping them. The training of instructor pilots in the field was one major problem: new tactics, NOE night and weather flying to increase future unit effectiveness

Colonel Ray Pollard
Chief, Aviation Division
Deputy Chief of Staff for Operations
Headquarters, U. S. Army Forces Command

WHILE THERE ARE many factors that make up the readiness equation, none is more important or as challenging as that of training. It is our objective that all Army aviation units attain and maintain the degree of training readiness required to provide 24-hour, responsive aviation support —regardless of the environment or weather.

Space precludes discussing the total U. S. Army Forces Command (FORSCOM) aviation training program here, but this article will cover the most significant areas—concluding with problems we are facing.

Soviet air defense systems employed by the Arabs during the October 1973 Middle East war have convinced skeptics of the validity of nap-of-the-earth (NOE) tactics. NOE training is gaining momentum throughout FORSCOM. Eight FORSCOM and four U. S. Army Training and Doctrine Command (TRADOC) installations have established NOE programs and are conducting NOE qualification training. Others are in the process of completing land-use agreements and laying out courses.

FORSCOM has categorized aviation units in a priority listing for conducting individual aviator NOE training. The program is focused on qualifying aviators assigned to priority I units indicated in figure 1. Time phases have been established as a means of setting goals and monitoring progress. These phases and target completion dates are shown in figure 2. Several installations are already well into Phase II. About 1,050 active Army and 40 Reserve Com-

This story is based on a briefing given by Colonel Pollard during the Army Aviation Program Review in August at the Aviation Center, Fort Rucker, AL

ponent aviators have been trained in NOE flight techniques.

One major problem that had to be overcome to get the program moving was the training of existing instructor pilots (IPs) from the field in NOE flight techniques. Resource constraints precluded the U. S. Army Aviation Center at Fort Rucker, AL, from accomplishing this training, except for a small number of trade-off quotas. To meet immediate demands for IPs for both active Army and Reserve Component units, FORSCOM tasked four installations to conduct NOE IP training (Fort Bragg, NC; Fort Campbell, KY; Fort Hood, TX; and Fort Lewis, WA). To date, about 225 IPs have been qualified; future requirements will be satisfied as Aviation Center IP programs are initiated (see "View From The Training Base," beginning on page 6 in this issue).

A unit that cannot operate routinely and effectively at night is only 50 percent combat ready. Proficiency in tactical night operations has become increasingly important. It is accented by recent intelligence reports indicating a Soviet reliance on and a capability of night combat. While there have been night flight requirements for the individual aviator for years, these requirements have not been translated into tactical night operations at the aviation unit level to the degree desired. FORSCOM recognizes the weaknesses in this area and has developed guidance requiring commanders to direct a *concerted, intensified effort* toward attaining a high level of proficiency for aviation tactical night operations. The efforts of the 101st Airborne Division (Air Assault) in this respect are notable (the October 1974 issue of the DIGEST featured the 101st Airborne Division (Air Assault) accenting its vigorous training program).

There are those who argue that the requirement for aviators to maintain instrument proficiency in many of our tactical units is becoming less important. But it is FORSCOM's view that this requirement is still valid. Aviation units must retain the capability to support the ground commander throughout the battle area under all-weather conditions. The issuance of a standard instrument qualification to initial entry students was not effected until FY 1972. Accordingly an extensive unit training instrument qualification program was necessary to attain this capability. Within FORSCOM's active Army units the program is about 97 percent complete. The majority of aviators remaining to be qualified are in a prohibited flight status because of their current assignments.

Some work remains in the Reserve Components. Latest reports indicate that 69 percent of the Reserve Component aviators have acquired instrument qualifications. While great strides have been made, resource constraints, civilian job conflicts and a lack of properly instrumented aircraft continue to impact on the timely completion of this program.

Much of FORSCOM's efforts are centered around devising programs and providing assistance to the Reserve Components with the goal of increasing readiness. In this regard FORSCOM, in coordination with the Aviation Center, is testing a program to bring selected Reserve Component aviation units to Fort Rucker for annual training. Earlier this year the Aviation Center developed a 2 week program of instruction (POI) for this purpose. As one senior officer phrased it, "The POI is designed to field strip, clean and oil the unit during the first week, and then after reassembly require it to perform as a functioning unit during the second week."

A prototype test of this program was conducted last spring with the 129th Assault Helicopter Company, an active Army unit from Fort Bragg. Test results indicate that the concept is feasible, within the capability of Fort Rucker, and extremely valuable from the standpoint of increasing unit training readiness. Plans are underway to identify candidate Reserve Component units to undergo this training.

Innovative training by individual units continues to be a cornerstone for the further development and exploitation of Army aviation capabilities. Three representative examples are discussed here.

Continued on page 26

FORSCOM NOE Aviator Training

Priority I

- Air cavalry troops
- Attack helicopter companies
- Assault helicopter companies
- Brigade aviation sections
- Artillery sections/groups
- Aerial Field Artillery batteries
- Air ambulance companies
- Special Forces detachments

Figure 1

NOE Training Phases

Phase I

Completion Target Date – End CY 74

- Active Army; FY75, Reserve Comp.
- Selection of NOE training area
- Establish boundaries
- Lay out flight routes (min 4)
- Complete all land use agreements
- Assemble and post hazard maps
- Select and train instructor pilots
- Complete lesson plans and SOP
- Training area-POI-SOP approved by installation commander

Phase II

Completion Target Date end CY 75, Active Army; CY 76, Reserve Comp

- Complete training and qualification of Priority I aviators

Figure 2

View From The Training Base

The author tells of the recent major changes in the Army Aviation Center's aviator training programs. The savings achieved by use of simulators have resulted in increased tactics, night and instrument instruction; IPs graduated will have a profund effect on Army-wide standardization

Lieutenant Colonel Ernest M. Wood Jr.
Director, Department of Resident Training Management
U. S. Army Aviation Center

TACTICS TRAINING Outlook

TOWARD THE END of the United States' involvement in the Republic of Vietnam we saw the level of sophistication of the enemy forces rise markedly. We discovered that flight techniques that had been so successful for years were resulting in unexpected losses. This was particularly true near the demilitarized zone and the operational areas adjacent to Laos and Cambodia.

To survive, we began flying at lower altitudes than had previously been required. The U. S. Army Aviation Center at Fort Rucker, AL, could no longer afford to prepare graduates for operation in a low-intensity environment. We chose instead to orient our tactical flight training to a European environment and to East European weaponry. We also found that the combat experience of the operational aviator was rapidly decreasing.

Our equipment was also changing. The massive drawdown of Army forces in Vietnam made available a significant number of UH-1 helicopters. Simultaneously technology had provided the Aviation Center with a new family of aircraft simulators.

In effect the aviation community was facing a requirement to address a rapidly increasing enemy threat capability. The reorientation required by this increase would be costly. But it had to be accomplished quickly. The timely introduction of these advanced state simulators gave the Army a choice. It could reduce aviation training costs or it could use the savings generated by the introduction of simulators to offset the cost of *increased* tactical flight training. The Army chose more tactics.

It was the simulator that gave us the flexibility to save flight hours in one portion of our program and increase flight hours in the tactical phase. Thus we are now producing tactically qualified aviators who, upon assignment to the unit, are prepared to receive unit training focused on a particular deployment scenario.

An excellent example of this reorientation in tactical training is the Initial Entry Rotary Wing (IERW) Course, the fountainhead of the aviator force structure. This course is the mechanism through which aviators possessing new skills, knowledge and operational techniques are provided to combat aviation units. During 1974 we will be producing about 55 officer and warrant officer aviators every 2 weeks. This graduate has received more tactics, more night and more instrument training than his predecessor.

Today's graduate receives the program depicted in figure 1. The program was designed with the needs of the combat aviation unit in mind and is considered a better base on which to build a combat effective aviator.

Speaking of tactics, I would like to discuss briefly our experience in teaching *terrain flight*. This is a term you may not immediately recognize. We at the Aviation Center have noted great disparity concerning the understanding of the term nap-of-the-earth (NOE). Many consider NOE to be flight at grasstop level, or between treetops, or just above the treetops —all of which may at one time or another be correct. But when considering that the purpose of such flight is to avoid enemy detection by taking maximum advantage of whatever natural or manmade terrain features lie between an aircraft and the detection mechanisms of the enemy, the term terrain flight appears to be more accurate—and thus less prone to misinterpretation. So the Aviation Center now refers to such flight as *terrain flight*.

We believe there is now wide acceptance of the fact that terrain flight training is required. However,

Initial Entry Rotary Wing Course

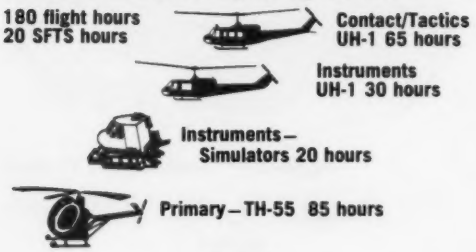


Figure 1

Tactics Flight Training

Current 65 hours		Optimum 85 hours
16	Contact	18 (2)
3	Contact Night	6 (3)
19	Tactical Flight	16 (-3)
12	Tactical Night	23 (11)
15	NOE	15 (0)
0	FEX	7 (7)

Figure 3

terrain flight training has been a learning experience for us. We, and units in the field, found that in most cases the military reservations were generally not large enough to support an active terrain flight program. When this training was moved "offpost" we found that public acceptance must be preceded by an active campaign to secure their support. We found that the procedure of flying an established course line had three major drawbacks:

- The student was not trained to select his route.
- The instructor quickly memorized the route.
- Free navigation allowing the injection of tactical problems was not permitted.

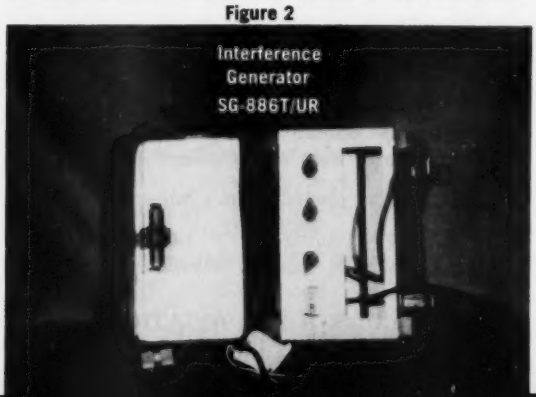
These drawbacks emphasize the fact that the ability to navigate is the cornerstone of terrain flight. To ensure proper navigation training we incorporated a "box" training concept.

Basically we have superimposed a division area of operations (AO) on the training area and further designated a brigade-sized area . . . a box . . . in which the student will enjoy free play to operate as low as is safely possible—both day and night.

By utilizing this approach, we challenge student aviators to apply the techniques of good planning, reconnaissance and navigation, while accomplishing given tactical missions—such as troop insertions and resupply operations. More importantly, because of the total environment, the student trains with full cognizance of a realistic tactical situation.

We believe that our experience may have application in the field. Thus, we are now attempting to define the parameters of acceptable terrain flight techniques and intend to incorporate these parameters into forthcoming Army training and evaluation programs and other training literature.

Figure 2



Currently our night instruction incorporates low level techniques, operations under conditions of reduced aircraft and landing zone lighting and ultimately . . . we will begin utilizing night vision devices in the initial entry program.

There is an increased emphasis on electronic warfare and electronic countermeasures through such means as the equipment in figure 2. With this equipment we can accurately simulate enemy jamming techniques and thus provide added realism to tactical problems.

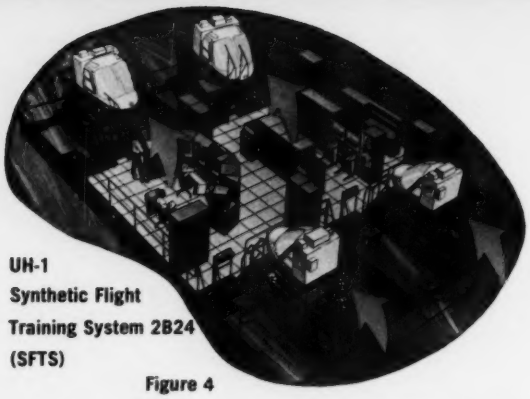
We also have moved into the area of low altitude tactical instrument flight at altitudes compatible with the requirement for limited all-weather capability in a high-threat environment.

These "experimentations" are an attempt to determine to what extent we can safely, and with confidence, exploit man and machine on the battlefield. The parameters determined at the Aviation Center will be disseminated to the field as standards by which a unit's combat readiness can be measured.

Manpower and budgetary restrictions must be considered in the development of training programs. However, the requirement to train combat deployable forces had to be weighed heavily in these deliberations. To assist in the development of a program fitting user requirements we have developed a model or optimum IERW Course. This gives the Aviation Center a base structure on which to manipulate the data from field visits, formal testing and other sources —against current constraint factors—and to modify or expand as necessary.

A comparison of the current 65 hour tactics phase with the optimum program is shown in figure 3. The additional 20 flight hours would allow further expansion of those subjects previously discussed and provide a level of flexibility for innovation not present in the 65 hour program.

This story was adapted from Colonel Wood's presentation at the Army Aviation Program Review in August of this year at Fort Rucker, AL



UH-1
Synthetic Flight
Training System 2B24
(SFTS)

Figure 4

This course has not been formally submitted and resources to support implementation have not yet been identified. We are still attempting to modify this course in consonance with the needs of the user. Nevertheless, we feel that this optimum program warrants serious consideration.

Earlier I mentioned flight simulation. We at the Aviation Center are quite enthusiastic concerning flight simulators. The 2B24 SFTS (synthetic flight training system) is the first simulator possessing high-fidelity to actual flight. This simulator consists of four UH-1 cockpits (figure 4); a controller's console; and related computer equipment (see "SFTS," September 1972 DIGEST).

The fidelity to actual instrument flight conditions afforded by the 2B24 is such that we are able to effect reductions in flight hours, particularly at the graduate level of training. Two courses where the 2B24 has made its performance well known are the Rotary Wing Instrument Course and the Rotary Wing Qualification Course.

Rotary Wing Instrument Course
Former Training (8 weeks)

Link Trainer
28 hours

UH-1H
42 hours flight

Figure 5

Rotary Wing Instrument Course
Present Training (6 weeks)

Simulator
34 hours

UH-1H
7 hours flight

Figure 6

Rotary Wing Qualification Course
Former Training

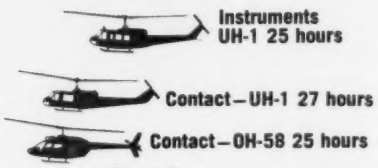


Figure 7

Rotary Wing Qualification Course
Present Training

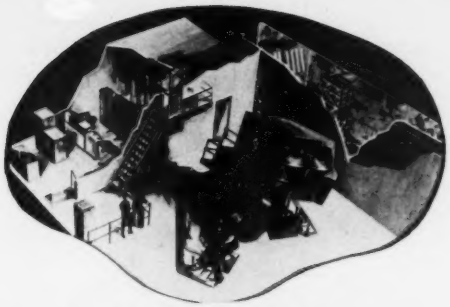
Figure 8

Prior to the use of the 2B24, the Rotary Wing Instrument Course was structured as shown in figure 5. As you can see, we relied heavily on the World War II vintage Link trainer and *actual* flight hours. The new course initiated last May is depicted in figure 6. It has been reduced from 8 to 6 weeks, only 7 flight hours are now used . . . and substantial savings have been realized.

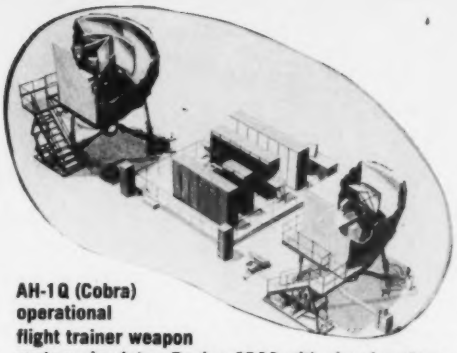
Rotary Wing Instrument Course savings:
$377,758
JP4 271,480 gallons

As shown in figure 7 our former Rotary Wing Qualification Course consisted of a 4 week OH-58 contact phase, followed by a 4 week UH-1 contact phase and a 4 week UH-1 instrument phase. Although this course qualified the aviator in the technical skills necessary to operate both the UH-1 and OH-58 helicopters, it did not address tactical employment. Therefore, it has been modified to that depicted in figure 8. The OH-58 phase has been eliminated and a significant reduction in aircraft flying hours made in the instrument phase. A tactics phase, to include instruction in such critical areas as night and terrain flight, has been added. In addition to the course improvements considerable monetary savings were also realized in this course.

Rotary Wing Qualification Course savings:
$978,397
JP4 235,320 gallons



CH-47 Operational Flight Trainer 2B31, with visual system engineering development unit



AH-1Q (Cobra) operational flight trainer weapon system simulator, Device 2B33 with visual system

Figure 9

Now let's look at simulators that are down the road. The CH-47 Chinook simulator—known as the 2B31—and the AH-1 Cobra/TOW simulator—known as the 2B33 (figure 9)—will consist of essentially the same systems identified previously for the 2B24 with one major exception—these two devices will be equipped with visual projection systems using one or more scaled terrain boards and optical probes to simulate visual flight conditions.

The 2B31 and 2B33, scheduled for delivery late in 1976, will be the Army's first attempt to equip helicopter simulators with visual systems. We fully expect these two simulators to permit the initial aircraft qualification of aviators and, in the case of the AH-1Q device, initial aircraft and gunnery qualification at reduced flying hour levels. In fact, we have determined through considerable testing and actual use in the IERW Course, that a substantial portion of the instrument flight phase can be converted to the simulator.

We now are testing the impact of the reduction of actual flight time on the student. For example, we can simulate instrument flight to a degree; what we cannot simulate is the stress that would be present in actual instrument flight training or a 100 percent simulation of the control responses.

We have not yet accumulated sufficient data to determine how far we can go with simulation. For example, we cannot teach contact maneuvers, tactics, night operations or ordnance delivery—we are unable to simulate 75 percent of the training and 99 percent of the operational requirement. So we believe that the Army should proceed with optimistic expectation, metered by objective conservatism, until the value of planned visual systems can be determined.

Our optimism is based upon the fact that there are visual devices for simulators. Probably the most widely accepted visual device is owned and operated by a commercial airline. But this visual device *only* has to show the commercial pilot a takeoff from a 10,000 foot runway . . . clouds for 3,000 miles . . . a landing approach to a high-intensity lighting system . . . and rollout on another 10,000 foot runway. This is a rather basic portrayal compared to the myriad of tactical flight tasks that we expect an Army aviator to perform. We believe that advances in visual technology, coupled with a comprehensive test and evaluation of the CH-47 and Cobra/TOW simulators, will pave the way to improved student quality at reduced training cost.

The Army Aviation Standardization Program is the Aviation Center's major onsite contact with an operational unit. Recognizing the importance of this program the Aviation Center has formed a hard-hitting, double-barreled program aimed at providing a boost to the all-out effort to promote worldwide safety and standardization. This program is conducted through the joint efforts of the Aviation Center's Office of Standardization and the U. S. Army Agency for Aviation Safety (USAAAVS), an agency of the Office of The Inspector General.

We now have a mechanism for evaluating training activities at any level through assistance visits, annual written and flight examinations, instructor pilot (IP) evaluations and the timely distribution of training literature. These visits to operational units are a major source of feedback information by which we can compare individual performance and unit performance worldwide. The information is used to modify programs of instruction, training publications and flight techniques. Again, this comparative data can be used in the development of those standards of performance expected of a unit.

The Aviation Center can have a profound effect on Army-wide standardization through its output of highly qualified instructor pilots. An example of its role in this effort is the Rotary Wing Instructor Pilot Course.

The Aviation Center currently conducts separate IP courses for each type aircraft which, although the best ever presented, do not produce a well-rounded IP. Let's take a look at a proposal designed to truly professionalize the IP force during the FY 1975/1976 timeframe. It consists of three phases (figure 10).

Continued on page 29

WARNING
AIRCRAFT INFRINGING UPON NON FREE FLYING TERRITORY MAY BE FIRED ON WITHOUT WARNING
CAUTION
AIRWAY G-5 FROM NORTHEIM INTXN TO FULDA VORTAC IS PROHIBITED TO USAF AIRCRAFT
FOR DETAIL SEE TERMINAL CHARTS

Instrument Training In EUROPE

Captain Donald B. Skipper
3d Armored Division

ANNUAL AWARD Monthly Winner CONTEST

The friendly skies of Frankfort . . . the "What If" game . . . good housekeepers . . . and first-class controllers are all a part of 3d Armored Division's Instrument School where THINKING is the first thing taught

TACTICS TRAINING outlook

"FRANKFURT Departure, Army 60907, off Rose at 11, estimate METRO [Pilot to Military Weather voice call] at 17, I have Tango."

"Guten Tag 907, squawk 351, call level 2000 . . . Lufthansa 727 cleared to FL 50, call Charlie. . . ."

"Frankfurt, 907, level at 2000. . . ."

"907, I have your Parrot, set course now for Hanau, cleared for FL 50, check passing 3 and 4. What is your estimate for Hanau? . . ."

So begins another day at the 3d Armored Division's Instrument School. The school was established in early June 1972 to upgrade the instrument ratings of the division's aviators and train incoming personnel on flying the friendly, crowded skies of Frankfurt, Germany. Each student aviator received 30 hours of flight training, 45 hours of ground school and 12 hours of Link [synthetic instrument flight] training during the course of instruction.

The pilots completed the rotary wing standard instrument course programed text prepared at the U. S. Army Aviation Center at Fort Rucker, AL, during the ground school training and attended numerous formal classes presented by the instructor pilots and viewed several excellent Army and Air Force films depicting instrumentation, radio navigation aids, approaches and weather. One of the most worthwhile portions of the ground school was a tour of the extensive air traffic control facilities at Frankfurt International Airport. Each class got a firsthand

look at the enroute, approach and tower facilities and gained insights into the problems of handling thousands of aircraft on a daily basis. The tour gave the German air traffic controllers an opportunity to brief the pilots on German flight procedures and created an atmosphere of lasting good will between the American pilots and the German controllers.

The flight training was broken down into two phases: 10 hours of basic instrument training to ensure that the aviator could handle the aircraft without devoting 100 percent of his attention to it; 20 hours of advanced instrument training conducted in the Federal Airways system of Germany to acquaint the aviator with advanced instrument flight procedures. Because of the lack of U. S. military instrument approaches in U. S. Army, Europe (USAREUR), the school used the German civilian facilities for most approaches.

All flights in the advanced phase of training were made on instrument flight rules (IFR) flight plans to ensure that the student pilot gained a thorough knowledge of flight planning procedures. The instrument school's unique location inside Frankfurt's traffic management area A placed an additional burden on both the instructor pilot and the German controllers. Without an IFR flight plan on file, at times it was impossible to accomplish the necessary training because of the extremely high density of commercial traffic. To accomplish the required training within the allotted 30-day period, it was necessary to make many of the flights under IFR conditions (legal in USAREUR with a USAREUR instructor pilot or examiner onboard the aircraft). The instructor pilots quickly realized that under the best of conditions an IFR cross-country flight into Stuttgart International with a student pilot can be a nerve-wracking experience. To combat this "instant terror in the cockpit" the emphasis in the ground school was on *thinking*.

There are two parts to flying in IFR conditions. One is knowing how to control the aircraft without outside reference. This is relatively easy to master and most of the students were confident "partial panel pilots" after 10 hours of basic instrument training. The second and possibly most important part to safe weather flying is navigation by radio, handling myriad communications for air traffic control (ATC) purposes, obtaining weather information, being able to locate the position of the aircraft, figuring time, distance, fuel problems and *thinking*.

One reason people get into so much trouble flying IFR is that they do not do enough logical thinking before they fly. The preflight planning for fuel reserves, weather analysis, route of flight, etc., must be done in a completely logical manner. *Desire alone does not a successful flight make!*

The ground school really emphasized clear, logical thinking *before* climbing into the cockpit. A pilot who has studied his proposed route of flight, studied his destination instrument approaches, studied his alternate and has thought out the entire flight in his mind is much more prepared to handle an enroute change, delay enroute, zero-zero weather at destination or a flight to an alternate than the all-too-common pilot who just "filed and flew." Anticipation of any eventuality led to the formation of the "What If" game.

On days when the weather was zero-zero or the aircraft were down for maintenance the instructor and students would perform an entire cross-country flight in the classroom with one instructor playing the part of ATC and one pair of students "flying their desks." The "What If" game became so effective and popular it was made part of the syllabus of instruction. The rules of the game were:

1. The flight was to be conducted as if it were real (i.e., the student pilots could not leave their seats).
2. ATC procedures were strictly adhered to.
3. All radio communications were spoken to the ATC instructor.
4. The actual time of flight or "real time" was used.
5. Only those charts, maps and approach plates normally in the aircraft could be used.

During these simulated flights time could be taken to explain the *how* or *why* of an ATC request. The simulated weather could be deteriorated to stimulate student thinking. What if the weather is reported to be below minimum at destination with fog forming at the alternate? What if you received instruction to hold at Salmunster intersection? How will this affect your capability to reach your alternate, if necessary? What if you have lost communications while holding?

The game gave the students time to think of logical solutions to the problems encountered without simultaneously having to worry about controlling the aircraft. During the "what if" session the students also learned that good weather flying is good housekeeping. One of our examiners liked to refer to good housekeeping as cockpit management.

The pilot learned to get out the charts he needed for the flight, the standard instrument departure applicable, the approach plate for the *airport of departure* (just in case he suddenly has a desperate need to return) and approach plates for the destination, stack them in order, put them on a clipboard and keep them close by so that they would be handy when he needed them. He learned the necessity of having a kneeboard strapped on

Each student toured the facilities at Frankfort International Airport for a look at the enroute, approach and terminal facilities located there

with some paper on it so he could copy clearance and estimates. He learned to copy weather and clearance changes, keep track of fuel and frequencies. When no contact was made on a frequency change, the student pilot just referred to his last frequency *written* on his kneeboard to reestablish contact.

Keeping a neat, organized cockpit makes instrument flying easier and more enjoyable but more important a disorganized cockpit increases the possibility of serious mistakes. The school instilled this need for planning and organization in the student before he ever started flying enroute IFR.

After three or four of these simulated classroom flights the student pilot was confident and prepared to fly IFR in the Federal Republic of Germany. He expected the enroute changes and occasional delays encountered while flying in the highest density air traffic area in Europe and confidently handled them.

The rapid progression of the student pilots was evident in their daily radio contacts with the German air traffic controllers, who were aware of the training program and goals and often gave our UH-1s a priority over commercial aircraft. An excellent example of our unofficial priority took place over Nurnberg International Airport:

Army 60877 was cleared for a backcourse localizer, runway 10 and report Nurnberg west. Clipper 784 was told to continue holding because our helicopter was on a practice approach.

The above situation actually transpired one autumn day in 1972 and is typical of the exceptional cooperation the school received from the German controllers.

Through the untiring efforts of the maintenance officers and personnel of the 503d Aviation Company the students averaged 30 hours of flight training in each 30-day training period. Maintenance personnel met the returning training aircraft each day and performed all required maintenance, including the intermediate inspections, before going home that evening to ensure that the aircraft would be mission ready the following morning (the first flight training period began each morning at 0700 hours, 7 days a week). From a fleet of four training aircraft there were always enough IFR capable aircraft to accomplish the mission.

The 3d Armored Division Instrument School successfully trained all the aviators in the division who required an initial issue standard instrument ticket and simultaneously trained those aviators assigned to a V Corps aviation unit (32d Signal Battalion Aviation Section) based at Maurice Rose Army Airfield before the 31 December 1972 deadline. Thirty students successfully passed grueling instrument checkrides often under IFR conditions and the watchful eye of an examiner.

The instrument upgrade program had vastly improved the overall proficiency, professionalism and readiness of the division's aviators. Although the original goal of 100 percent upgrade of unwaivered aviators had been achieved, it was decided to continue the program in order to train those aviators in the division that are currently on a waivered status.

The school has been relocated at Budingen Army Heliport as a mission of D Troop, 3/12 Cavalry and will continue indefinitely to train those waivered aviators and newly assigned personnel that have not yet upgraded their instrument ratings and to serve as an instrument flight refresher course for aviators renewing their tickets.

On 6 June 1974 aviation pioneers were inducted into the U. S. Army Aviation Hall of Fame. The AVIATION DIGEST has printed biographies of two. This is the third, LTG Robert R. Williams (USA, Ret.), who is considered by many as the "Father of Army Aviation"

Lieutenant General Robert R. Williams (USA, Retired)

In the photo to the left, Colonel Robert R. Williams (left) congratulates Captain James Bowman and Mr. Joe Givens in 1956 after having stayed airborne in an OH-23 helicopter for 30 hours while covering a distance of 1,520 miles

ARMY AVIATION HALL OF FAME

LIEUTENANT General Robert R. Williams' (USA, Ret.) association with Army aviation began at Fort Sill, OK, immediately after his 1940 graduation from the U. S. Military Academy as a Field Artilleryman. While with the famous "Class Before One" he helped to validate the need for light aircraft in the artillery adjustment role. As flight division chief, Department of Air Training, he organized the Army's first aviator training program and became the first ground force officer to receive an instrument rating.

During 1947 in Europe he organized the first ground force aviation unit, the U. S. Constabulary Flight Detachment. He was the first chief, Army Aviation Branch, G-3, Department of the Army, which later became the Directorate of Army Aviation. He also was the first active duty Master Army aviator. In 1955 he organized and was the first president of the U. S. Army Aviation Test Board and was a cofounder of the Army Aviation Association of America (AAAA) in 1957. In 1962 he assumed command of the U. S. Army Aviation School at Fort Rucker, AL, and was reassigned a year later as commander of the Test and Evaluation Control Group which evaluated and validated the test of the 11th Air Assault Division at Fort Benning, GA. General Williams served as Director of Army Aviation during 1966 and 1967, followed by 2 years as commanding general of the 1st Aviation Brigade in combat in the Republic of Vietnam. He was Deputy Assistant Chief of Staff for Force Development — serving for extended periods as the ACSFOR —until he was promoted into that duty in 1970. During this period the aircraft family for the 1980s was conceived and adopted. General Williams served as the deputy commander-in-chief, U. S. Army Pacific, before retiring in August 1974.

Throughout his career General Williams has been in the forefront of the development of airmobile concepts and has vigorously promoted Army aviation from positions of great responsibility in both peace and as a combat leader.

Experimental evidence shows that a parachutist experiences no difficulty in achieving vertical and horizontal separation from an autorotating helicopter. At high rates of descent, there is a 0.75 second delay before vertical separation begins

Colonel William P. Schane, M.D.

This article is adapted from a presentation made by the author at the 30th Aerospace Medical Panel Meeting, AGARD, Soesterbreg, Netherlands, 3-7 September 1973

IN SPITE OF SCATTERED reports to the contrary, legend among helicopter pilots has it that if a crewmember were to bail out of a disabled helicopter he would be struck by the rotating blades. Logic does not support this contention. There are several pieces of background information upon which deduction may be based:

• First, the maximum rate of descent in autorotation for most helicopters is mathematically placed somewhere between 2,600 and 3,000 feet per minute (although at least one helicopter, the AH-1G Huey-Cobra, can be forced to a rate of descent as high as 5,000 feet per minute).

• Second, the average stable free-fall parachutist falls at a rate of about 12,000 fpm; by presenting minimal surface area to the relative wind, this rate can be increased to as much as 21,000 fpm.

• Third, when the escaping crewmember leaves the disabled helicopter he will begin his acceleration to his eventual equilibrium velocity from a baseline velocity equal to the rate of descent of the helicopter at his moment of exit.

Thus, logic dictates that the jumper will achieve an ultimate equilibrium velocity greater than the worst possible sink rate of an autorotating helicopter. One must therefore conclude that the jumper should always be able to fall away from such a helicopter, provided the main rotor blades are still turning and providing some lift.

To test this hypothesis a series of jumps was made from an autorotating UH-1H helicopter. The exit and separation of the parachutist from the helicopter were documented by 16 mm motion pictures taken at 32

Figure 1

Jump	Approximate Vertical Speed Ft/Min	Measured Vertical Speed Ft/Min	Exit Altitude Ft AGL
1	0	0	4400
2	500	650	4900
3	1000	1500	4800
4	1500	1840	4100
5	2500	2700	3700
6	3000	2880	4400
7	3500	3240	5100
8	3500	3080	3800

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PARACHUTE ESCAPE FROM HELICOPTERS

frames per second with an Arriflex motion picture camera and by 35 mm slides taken four frames per second by a motorized Nikon camera.

The photo platform was a chase helicopter flying precise formation with the jump helicopter. The motion pictures were submitted to a frame-by-frame analysis with data being obtained by measuring and recording the distance separating a reference point on the parachutist from a reference point on the helicopter throughout the film sequence. The distance from the most anterior portion of the nose to the most posterior portion of the tail boom of the jump helicopter was used as a reference length.

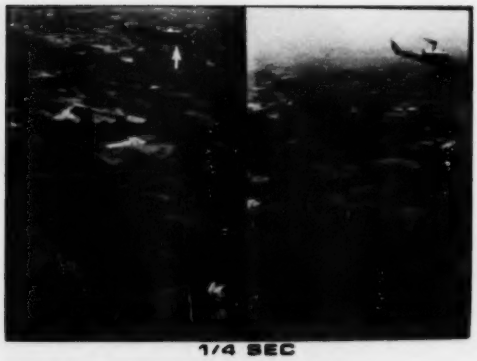
The approximate rates of descent of the jump helicopter during the test were established using the vertical speed indicator aboard the jump helicopter. The precise rate of descent at the moment of parachutist exit was determined using a recording altimeter which provides precise altitude information above ground level. This recording radar altimeter continuously plotted the position of the aircraft above ground level. The exact time of the parachutist's exit was marked on this plot. The helicopter's rate of descent at the moment of the exit was determined by establishing the slope of the plot of altitude versus the time at the moment of the exit.

Eight parachute jumps were made at progressively increasing rates of helicopter descent. For consistency, forward airspeed was maintained at 100 knots and the needle and ball were centered. Jump parameters are summarized in figure 1.

The test results are summarized in figure 2. The numbers in each cell represent the distance in feet between the reference point on the aircraft and the reference point on the jumper at the indicated second or fraction thereof after exit of the parachutist from

Figure 2

Jump	Measured Vertical Speed Ft/Min	Time in Seconds Exit = Time 0												
		0		1/2		1		3/2		2		5/2		3
1	0	2.4	4.0	8.4	15.8	24.1	34.8	47.9	61.6	77.2	92.3	111.6	132.8	150.6
2	650	4.0	7.8	11.7	17.7	27.1	38.4	49.7	62.7	88.1	98.7	118.3	139.9	166.0
3	1500	6.9	7.6	9.9	18.2	29.9	40.7	56.6	69.4	98.9	117.7	141.8	164.0	199.0
4	1840	3.1	3.8	3.5	3.7	6.3	12.4	20.4	30.8	43.8	47.8	75.2	88.2	110.6
5	2700	1.9	2.7	2.4	4.7	8.6	14.4	21.1	29.0	37.6	47.6	58.8	71.9	86.0
6	2880	3.4	3.5	2.4	2.0	6.3	13.0	21.9	31.8	43.6	58.9	74.4	92.5	112.7
7	3240													
8	3080	2.9	3.1	3.2	4.3	8.0	13.5	20.6	29.5	39.6	51.8	66.2	82.5	99.8



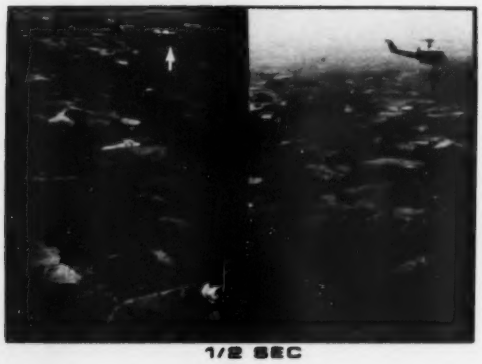
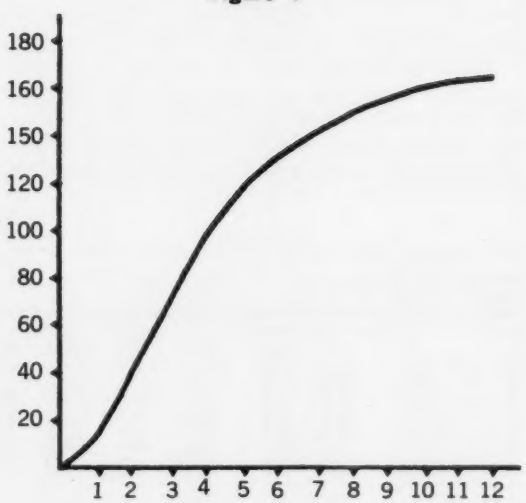


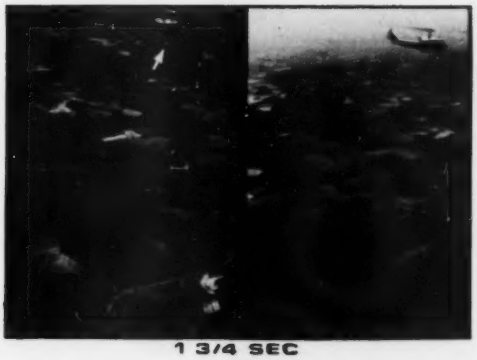
Figure 3

the aircraft. No information is available in jump number seven due to a malfunction of the motion picture camera. In jumps one through six exits were stable and free-fall uneventful. In jumps seven and eight the parachutist was uncontrollably rolled 180 degrees clockwise onto his back immediately after separation from the helicopter. Stability was regained without difficulty and the remainder of the free-fall was uneventful.

Figure 3 shows side-by-side photographs of the first 2 seconds of free-fall at helicopter rates of descent of zero feet per minute on the left and 3,080 feet per minute on the right. In each case the parachutist is marked by an arrow. It is clear from these photographs and from the data that the parachutist experienced no major difficulty in achieving vertical separation from the helicopter even when it was descending at rates of descent which approach the limit of safety for the aircraft. Motion pictures also show adequate horizontal separation from the rotor system by 1.5 seconds after exit. Based upon this information, we can confirm the initial premise that the main rotor system poses no threat to a parachutist leaving a UH-1H even at rates of descent which approach the limit of safety.

Figure 4





1 3/4 SEC

1 1/4 SEC

Figure 3

1 SEC

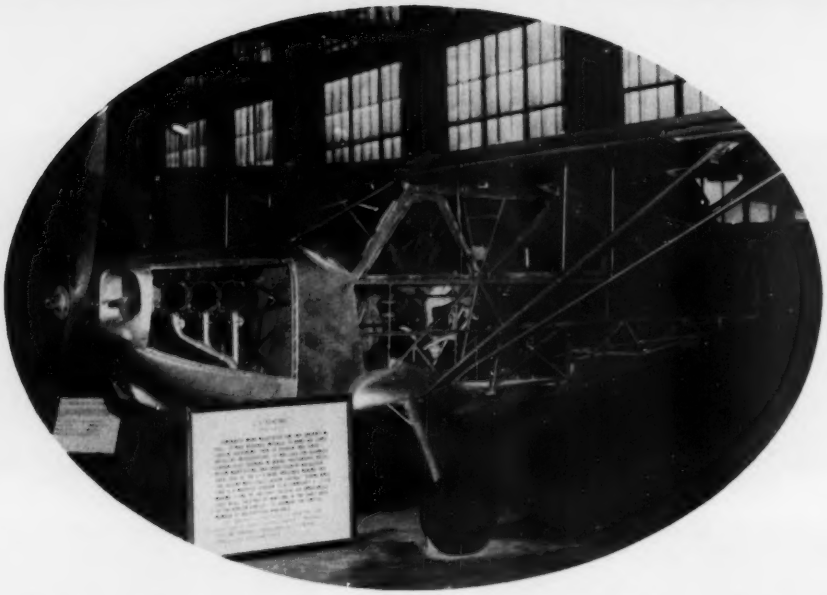
2 SEC

The vertical velocity plot of a stable parachutist during his acceleration phase from an initial vertical velocity of zero is shown in figure 4. Preliminary consideration suggested that as the rate of descent of the helicopter increases, the major modification in the parachutist's acceleration curve would merely be that he would enter the velocity curve at a point equal to the vertical velocity of the helicopter at the moment of his exit. Data from jumps one, two and three tend to substantiate this premise. However, in jumps four, five, six and eight (shaded in the figure), an unusual observation was made. There appears to be a delay in the neighborhood of 0.75 seconds during which time the parachutist falls in proximity to the descending helicopter before he begins to show the expected rapid separation from the aircraft.

Peculiar airflow patterns may occur around helicopter fuselages, especially during unusual flight maneuvers. It is possible, for example, to read as much as 10 knots difference in the indicated airspeed of a helicopter merely by changing the position of the dynamic port of the pitot static airspeed indicator system. Also, it has been determined that the cargo viewing mirror, which can be mounted on the nose of a UH-1 helicopter to view sling cargo loads, causes about twice the drag as would be calculated from its geometry alone.

The statistics obtained suggest that there is an area close to the skin of the aircraft which provides greater than the expected buoyancy when the helicopter is in a steep autorotational glide. When the parachutist escapes from this area, he begins an expected acceleration away from the descending helicopter. The uncontrolled rolling of 180 degrees experienced by the parachutist when rates of descent were above 3,000 feet per minute suggests that he was experiencing differential buoyancy along his Y axis with higher buoyancy on his inboard shoulder and lesser buoyancy on his outboard shoulder. This exit from the right door, facing the earth and in the direction of flight, caused him to rotate clockwise. Eventually, however, after this initial delay of about .75 seconds the parachutist rapidly fell away from the descending helicopter and experienced no further difficulty in separation.

Information outlined here confirms the premise that the main rotor system poses no threat to a parachutist leaving a UH-1 helicopter at rates of descent approaching the limit of safety.



Army Aviation Museum Association

Lieutenant Colonel William H. Howell (USA, Retired)
Curator, U. S. Army Aviation Museum

The nonprofit Army Aviation Museum Association was formed in 1969 with the intention of building the proud heritage of Army aviation. Unenhanced by limited display facilities at Fort Rucker, the Museum Association plans a vast new building one-half mile from the Ozark gate

IT SEEMS THAT $25.00 would be hardly worth mentioning when you could talk about $1,500,000 instead. But the Army Aviation Museum Association, Inc., is capable of thinking "big" or "small"—as long as it benefits Army aviation and the U. S. Army Aviation Museum at Fort Rucker, AL.

The Museum Association was hardly thinking small when it recently initiated a program of awarding a $25.00 U. S. Savings Bond to the author of the best article appearing each month in the U. S. ARMY AVIATION DIGEST. This thinking was just as "big league" as the Association's planning for a $1,500,000 museum building.

By instigating a writing awards program, the Museum Association seeks to motivate those associated with Army aviation to write and think about tactics, research and development, training, maintenance and all other aspects of their profession. The Association also will be presenting annual awards for the three best articles of the year. Details are included in the box accompanying this article.

The $1,500,000 building is intended to develop and build the proud heritage of Army aviation—and thus motivate Army aviation people to higher degrees of professionalism and pride. The building now is close to being a reality, primarily due to the efforts of Mr. Douglas Brown, Chairman of the Board of the Museum Association. Plans call for the new building to be on a tract of government land near the east gate on the Ozark side of Fort Rucker. A bill transfering title to the land to the Ozark Public Building Authority (which will be instrumental in constructing the building) is before the Congress of the United States. It already has passed the House and Senate subcommittees.

The Museum Association was formed by a group of prominent Fort Rucker area businessmen in 1969. They were interested in seeing the U. S. Army Aviation Museum collection properly housed and grow to national prominence as a major aviation museum. Major General Delk M. Oden (USA, Ret.), then commander of Fort Rucker, actively supported the idea of such an organization with the stated purpose of raising funds to build an adequate and permanent museum facility on Fort Rucker. The nonprofit corporation was formed under the laws of the State of Alabama and given the status of a nonprofit organization by the U. S. Internal Revenue

MUSEUM

AVIATION DIGEST
Writing Awards

The Army Aviation Museum Association is sponsoring a monthly and annual writing awards contest to recognize the best articles appearing in the U. S. ARMY AVIATION DIGEST. Each month the Museum Association awards a $25.00 U. S. Savings Bond to the author of the best article appearing in that issue.

At the end of the fiscal year three annual winners will be selected from the monthly first place winners. The Museum Association will award the author of the article selected as best of the year an engraved bronze plaque plus a $100 bond. It will award second place a $75.00 bond and certificate and third place a $25.00 bond and certificate.

Monthly first and second place authors also will continue to get certificates. Nonwinners each month will be presented a certificate stating that they have had an article published in the U. S. ARMY AVIATION DIGEST. All published authors are credited in their 201 files, or appropriate personnel records if they are civilians.

To be eligible for an award an article must be original and concern Army aviation or related subjects. Dual authored articles are not eligible for the contest, but they can be selected for publication.

Winning articles are selected by judges who review the manuscripts without bylines. Selection is based on accuracy, completeness, originality, readability, soundness, substance and overall merit. If you would like to discuss a topic, write us or call: commercial number, 205-255-3619/6680; AUTOVON, 558-3619/6680.

Authors should include pictures, diagrams or charts available or necessary to illustrate manuscripts. Your articles should be submitted to: Editor, U. S. ARMY AVIATION DIGEST, P. O. Drawer P, Fort Rucker, AL 36360.

Service so contributions would be tax deductible.

As the Museum Association was being organized, General Oden gave his full support and interest to developing the present museum in order to increase the collection of historical aircraft and memorabilia and to draw the interest of the visiting public. Recent efforts have provided more building space to get as many of the 71 aircraft as possible out of the weather to prevent deterioration. The museum now occupies four large warehouses adjacent to the maintenance training hangar on the main post (see photo). Maintenance support is active to accomplish preservation and storage of these valuable historic aircraft. Fort Rucker is supporting the Museum Association in order to get a new facility constructed as soon as possible.

The present plan of the Museum Association is to build the museum on a 45 acre site on Andrews Avenue East between the Ozark gate and Hooper Army Airfield. The facility will be constructed in several phases, the first to consist of about 40,000 square feet of floor space at a cost in the neighborhood of $1,500,000. The museum will be staffed and operated by the Museum Association. Admission charge and a gift shop will provide funds to defray operation costs and amortize initial construction financing. The next phase will be constructed as funds become available through donations and surplus revenues from the operational income.

When the Ozark Public Building Authority has title to the land, it will raise the $1,500,000 through a bond issue, construct the facility, then lease it to the Museum Association. This nonprofit corporation then will assume financial and operational responsibility for the museum. The historical aircraft and other Army historical properties will be placed on loan to the Museum Association for display but will remain the property of the Center of Military History, Headquarters, Department of the Army. They will be controlled by the Historical Property Office at Fort Rucker which will be responsible for restoration and storage of items

which cannot be displayed. Between the efforts of Fort Rucker and the Association, the museum will not become static but will grow in size and quality in order to present the story of Army aviation and the Army to the visiting public.

Since its beginning in 1969 the Museum Association, whose Board of Directors consist of members from Ozark, Daleville, Enterprise, Dothan and Fort Rucker, has attempted several approaches to its goal of building a museum. The initial plan was to raise funds through a national drive to build a facility on Fort Rucker and donate it to the Army. This plan was abandoned due to the poor economic climate in the aviation industry which would have to donate most of the funds. Another plan was to have the State of Alabama form an Army Aviation Museum Commission, build a state owned facility and operate it similar to the Space Museum in Huntsville, AL. This bill was introduced in the Alabama legislature but did not reach the floor before adjournment. Mr. Brown then presented the current plan (which now is before Congress) to the Board of Directors and the commanding general of Fort Rucker.

The new Army Aviation Museum not only will tell the story of Army aviation from its beginning in 1942 to its present important role in airmobility capabilities of supporting the ground soldier but also will be a memorial to the dedicated Army aviation personnel and the industry. This proud live history presentation will be educational and inspirational to future Army aviation personnel and the visiting public.

Above, weather deterioration influenced the expansion of the present facilities as many aircraft were displayed outside. Below, the addition of another building to the museum complex helped, but overcrowding is still a problem

WHERE WE ARE

Continued from page 3

• Overall, our combat readiness flying program has been updated. Most significantly, orders have been issued for the Army at large to conduct nap-of-the-earth (NOE) training.

• Aviators are coming under Officer Personnel Management System (OPMS). Immediate adjustments in the career handling of aviators are required, particularly in light of the new flight pay legislation.

The mid-intensity battlefield points out three major deficiencies in Army aviation. The first is doctrinal

In summary, Army aviation looks well overall. But to complete the assessment of our current status and keeping in mind the contrasting wars of Vietnam and the Middle East, how well would our current post-Vietnam aviation force have fared in a mid-intensity war along the Suez Canal and Golan Heights? It is my conviction that no aviation unit in the Army today could have avoided unacceptable losses if committed in that environment. In fact the best units in Vietnam, and there were many, would have been cut up badly in the Middle East because they were neither trained, equipped nor mentally prepared for the type of combat encountered.

An objective assessment of current aviation capabilities to meet the needs of the mid-intensity battlefield brings three major deficiencies into sharp focus. Each is interrelated and all three must be corrected if we are to get out of our people and machines what we have invested in them—and if we are to successfully meet the challenges of the future.

The first major deficiency is doctrinal. We must revise our concept of fighting to include operating against armor supported by sophisticated air defense weapons. As an army we seem to have been doctrinally marking time until the Cobra/TOW [AH-1Q] appears. We will begin receiving the Cobra/TOW in tactical units next year. But how will attack helicopter units be employed against tanks and on a battlefield with heat-seeking missiles and radar-controlled antiaircraft guns?

Most people think of attack helicopters in terms of air cavalry, which translates into *light combat, avoid decisive engagement.* Also, most people think in terms of fighting light fire teams—that is, two attack helicopters pitted against an enemy target, perhaps with the help of aerial scouts. Instead we must think of employing attack helicopters as we employ tanks—in mass—by platoon, company and battalion. And they must be integrated with other ground elements and support by suppressive fire from artillery and tactical air.

If we look back on how we fired up the aviation effort in Vietnam, we would find a blueprint in the Howze Board airmobility concept. But times have

Proponent	Aircraft	Key Organizations
Armor School	Attack Helicopter Light Observation Helicopter	ACCB Air Cavalry Troop/Squadron Attack Helicopter Company/ Battalion
Transportation School	Heavy Lift Helicopter	Heavy Helicopter Company Transportation Aircraft Maintenance Company
Intelligence School	Surveillance Aircraft	Aerial Surveillance Company
Aviation Center	Utility Aircraft Medium Lift Helicopter	Air Traffic Control Company Assault Support Helicopter Company
Infantry School	Utility Helicopter	Combat Aviation Battalion Assault Helicopter Company General Support Aviation Company
Artillery School		Aerial Field Artillery Battery/Battalion

changed; we have no blueprint now such as the air-mobile division and air transport brigade had. The Howze Board's third organization was the air cavalry combat brigade (ACCB). We decided to test it after the war and after 3 years of testing it still is not well based doctrinally for today's battlefield environment.

However, the ACCB appears to be the right unit for determining and demonstrating the concepts that will get a full measure in combat capability out of our people and machines on the high-threat battlefield.

With Cobra/TOW, the ACCB is a heavy combat unit. It should be capable of decisive combat engagement because it has the essentials of real combat power—firepower and mobility. It has each of these ingredients in large measure. When properly employed it also has a high degree of impact.

While a helicopter force can't hold terrain in the same context as the infantryman or tanker, it has the capability to dominate and deny key terrain. Moreover it has the capability (when suitably integrated with other combat forces) of going into early exploitation behind enemy lines where the real combat paydirt is.

Provided the right doctrine, the ACCB could exploit the firepower and mobility of the helicopter while reducing its vulnerability. I believe that the mission statement for the ACCB, as a primarily anti-armor force, and its reorganization as a separate brigade gives us the ideal testbed to resolve doctrinal uncertainties. Suitably integrated with other combat means, it should be able to do what airborne and armor formations accomplished in World War II.

Equipment capabilities is the second deficiency

The second major deficiency in our current aviation capabilities, as pointed out by the Middle East war, concerns our equipment. Combat aviation units need more staying power in terms of both survivability and effectiveness. To increase our own survivability and to enable the Air Force to provide better close air support, we need the capability to defang enemy air defenses. Just as our armored forces must use covered routes in the attack and suppressive fire to deter or defeat enemy fired antitank guided missiles and shoulder fired antitank weapons, aviation forces also must use covered routes with NOE techniques and suppress enemy air defenses with area and point weapons. They need such technical improvements as radar warning receivers, chaff and radar-seeking missiles.

To increase our effectiveness, we must be organized to operate around the clock—and not just be transient daytime visitors to the battlefield. The night vision equipment supplied to Syria and Egypt should be adequate warning that the Soviets intend to push their attacks at night in order to maintain their offensive momentum. This means that we must fly at night on a regular, sustained basis, either with or without night vision aids. Obviously, we must gain confidence in operating without vision aids before we take on sophisticated equipment which may be available to only a limited number of aircraft.

We also should be able to operate intermittently into and out of front line instrument conditions, in an electronic warfare environment and in icing conditions. Russian helicopters generally are equipped to operate in icing conditions; however, during the Vietnam years we were not even required to think about ice.

Staying power deficiencies all have been studied in recent years; *now* is the time to step in and begin resolving them.

The current status of training is the third deficiency

The third and perhaps the most damning deficiency in our current status is training. This is an Army-wide deficiency that is easily within our capability to correct—if we choose to. And if we don't our efforts to develop proper concepts, reduce vulnerabilities and increase effectiveness will have been to no avail. We must eliminate the general misconception that aviators can do the routine kind of stateside, peacetime, administrative flight which will enable them to accomplish their combat missions.

Even those units that think they know nap-of-the-earth probably only know their own military reservations. Some months ago, General W. E. DePuy,

TRADOC commander, remarked that we should not spend the bravery of our people to make up for our lack of preparation. This comment applies specifically to aviation training in the Army today.

Let me touch on the preparation measures we are taking at the Aviation Center at Fort Rucker, AL. Each is discussed in more detail by Lieutenant Colonel Ernest M. Wood Jr. in his article, "View From The Training Base," beginning on page 6 of this issue.

We are placing much more emphasis on tactics, NOE skills, electronic warfare/signal security, night operations and tactical instrument work. All of this is accomplished in an operations order environment so that the student thinks in tactical terms from the start. Our thinking here also includes the preparedness of Reserve Component aviation units. We are encouraged by test results of an Aviation Center test program designed to bring selected aviation reserve units to Fort Rucker for annual training. Colonel Arnold R. Pollard discusses this program in his article, "Aviation Training In FORSCOM," beginning on page 4 of this issue.

To conduct training without an inordinate increase in cost, we have made a threefold increase in the use of the synthetic flight trainer, from 7½ to 20 hours. We expect to turn the hours and funds saved through this device into more extensive tactical training. Our aim is to qualify the new aviator in modern flight fundamentals, so that when he reports to his first unit he is a fully participating asset, not a new training requirement. I should add that commensurate changes are being made in graduate level courses. The most dramatic is the instrument qualification course where we have turned back 35 hours of aircraft flight time, and now qualify experienced aviators with the synthetic flight training system (SFTS) and only 7½ aircraft hours.

While Fort Rucker can and should lead the way in tactical training, pumping our newly rated aviators into the bottom of the pyramid isn't going to put us into the new tactics business nearly fast enough. Our field units must move quickly to train the old aviators. However, in the field there is a wide range of reasons and convenient excuses which obstruct or preclude effective tactical training:

- First there is a general *lack of threat awareness* among aviators.
- There is a general *lack of standardization*. This means that aviators Army-wide are not operating their aircraft technically in accordance with prescribed procedures.
- A *misplaced and misunderstood safety emphasis* inhibits commanders from bringing their aviation units to an appropriate degree of combat effectiveness through good, hard training. *I say misplaced* safety emphasis because I am of the opinion that better tactical training can be conducted safely. Despite extensive student NOE training at Fort Rucker, in 1974 only one aircraft was torn up in tactical training. *I say misunderstood* because we are sacrificing lives on a future battlefield for the sake of avoiding potential criticism on anticipated safety statistics. As an example of how safety rules impinge on realistic and practical training, one major installation prohibits aerial gunnery below 100 feet and night flight below 500 feet.
- Finally, there are *inadequate readiness standards* both for individual aviators and tactical units. I recently attended a meeting of more than 200 unit aviators at Fort Bragg, NC, primarily field grade and captains. By a show of hands, only five indicated they ever have been on an NOE course. Neither have we qualified all working aviators in helicopters despite requirements placed on the Army in 1971.

Much work must be done if Army aviation is to meet the challenges of a mid-intensity war

To correct our training deficiencies we need strong readiness guidelines and a standardization program with teeth.

The 1974 Army Aviation Program Review made the point that there is much work to be done now, if the Army and its aviation effort is to be prepared to meet the challenges of a mid-intensity war. The helicopter can provide significantly increased tactical capabilities and combat power if we exploit it properly. But, we must orient our doctrine to this type of battle. We must reduce our vulnerability and improve hardware capabilities in those areas outlined above, and we must institute a tactically oriented training program to meet realistically set readiness requirements.

We know *where we are* and *where we are going*. In next month's DIGEST I will discuss the priorities we must establish to meet Army aviation's goals.

TACTICS TRAINING outlook

A Case Study Of

INSTRUMENT REFRESHER TRAINING

Robert N. Isley
Senior Scientist
Human Resources Research Organization
Division No. 6 (Aviation)
HUMRRO

THE HUMAN RESOURCES Research Organization (HUMRRO) and the U. S. Army Aviation Center (USAAVNC) at Fort Rucker, AL, are engaged in a project designed to determine the contribution to proficiency flight training programs that could be made by appropriate usage of the Army's new UH-1 simulator (Device 2B24). During an early stage of this activity an unusual opportunity presented itself: an individual who had been off flying status for about 5 years because of hypertension. In fact he was grounded immediately after receiving his wings in 1967. Upon returning to flight status in 1972 he enrolled in the USAAVNC program to upgrade rotary wing tactical ticketholders to standard instrument rated aviators.

When we at HUMRRO first learned about this individual, whom we will name Captain Smith, he had completed the ground school portion of the upgrade training, including several hours in the "blue box"; he had received two hood flights in the UH-1 Huey helicopter and was experiencing considerable difficulty both in maintaining aircraft control and in the application of instrument procedures. Our interest in CPT Smith was prompted by a desire to find out more about the effects of a long absence from flying and to learn how much and what kind of training would be required for him to regain proficiency. In short, here was a golden opportunity to assist an aviator having problems and at the same time perhaps shed some light on how the simulator might be used in this and similar cases. Consequently, it was arranged with the Aviation Center to suspend CPT Smith's flying activities and enroll him in an experimental program of simulator flights.

On his first visit to the 2B24 CPT Smith met his flight instructor and took a diagnostic flight in the simulator. The purpose of the diagnostic flight, which was in the form of a roundrobin mission and included all four instrument approaches, was to ascertain the status of his current proficiency. During the next 2½ weeks he received instruction in both instrument and UH-1 emergency procedures. His progress through this course of instruction was pro-

ficiency-based with concentrated training in those areas where his proficiency was found to be weak or lacking during the diagnostic flight. When the instructor believed CPT Smith to be ready, a standard instrument checkride was given in the simulator and CPT Smith completed it successfully. The pilot training time in the simulator had been about 24.5 hours. In addition CPT Smith functioned as copilot for approximately 12 hours, during which other students were receiving instruction in the pilot's seat of the device, and he spent about 9 more hours in the jump seat observing other trainees.

After completing the simulator checkride CPT Smith received two instrument orientation rides followed by an instrument checkride, all in the UH-1 aircraft. He completed the checkride successfully and was awarded a standard instrument rating. His total aircraft time following the simulator training was 4.5 hours.

The fact that Device 2B24 can be used for instrument pilot training is no longer remarkable. Indeed, it is used daily at the Aviation Center for that purpose and judging from the comments of those who have flown the device (as well as the long list of aviators waiting for chances to log some time in it) its acceptance by students and instructors alike has been nothing less than fantastic. Of particular interest in the present case is the successful use of the device with an appropriate program of instruction in a totally new application, i.e., refresher training for aviators who have been off of flight status for varying periods of time.

It would be unwarranted to base conclusions on the results of a single case. Additional data are currently being collected at USAAVNC to determine what portion of the flight proficiency training task can, in fact, be accomplished in a modern, high-fidelity simulator on the ground. However, CPT Smith represents an extreme in terms of time off of flying status and it is encouraging to note that flight skills can be regained readily using the simulator after such a long period.

Aviation Training In FORSCOM

Continued from page 5

The 159th Assault Support Helicopter Battalion, 101st Airborne Division (Air Assault), in late 1973 completed a self-generated training exercise as a first step in exploring the feasibility of overwater deployment of the CH-47 helicopter. Designated Operation Longhaul, this flight from Homestead Air Force Base, FL, to San Juan, Puerto Rico, consisted of a nonstop, overwater flight of 900 nautical miles—more than twice the normal operating range (see "Operation Longhaul," February 1974 DIGEST). The additional range was obtained through installation of a unit designed system of interconnecting 400 to 600 gallon fuel tanks in the cargo compartment of each aircraft to the internal aircraft fuel system. This mission provided invaluable experience in the training and support required for overwater helicopter deployment. Plans for Operation Longhaul II, an Atlantic Ocean crossing, are being prepared (see "Operation Longhaul II," October 1974 DIGEST).

At Fort Benning, GA, the 145th Aviation Battalion has fabricated an NOE navigation simulator from plywood and salvaged UH-1 components. This inexpensive trainer incorporates a visual 3-D display of the Fort Benning NOE course and includes a realistic audiosimulation feature. Although still under evaluation, the simulator may prove extremely useful in overcoming a serious problem in teaching NOE techniques—that of low level navigation.

A Reserve Component unit, the 1042d Military Intelligence Company (Aerial Surveillance), Oregon Army National Guard, in cooperation with the Oregon Forestry Department, has developed an innovative training program which pays off handsomely for both the unit and the state. This program uses the infrared (IR) capability of the OV-1 Mohawk to determine the precise location of forest fires. Unit imagery interpreters plot this IR information on aerial photographs or maps. This information is then transmitted throughout the firefighting organization. These examples of innovative training aptly demonstrate the positive approach by Army aviation in the pursuit of optimum training readiness and expanded use of its capabilities.

Figure 3

During the past year FORSCOM's aviation assets have been used extensively to support DOD directed operations. Two of these operations are described below.

Red Scarf was the code name of the retrograde operation using CH-47 helicopters in support of the U. S. Army Air Defense Command (ARADCOM) phaseout. CH-47 Chinook units from four installations were brought to mission readiness by intensive crew training and demonstration of proficiency through successful completion of a technical proficiency inspection (TPI) before being deployed to bases of operation from coast-to-coast (figure 3). From these bases of operation the units flew more than 1,200 operational flight hours transporting missile components from ARADCOM sites to Army depots or to military airfields for further shipment by Air Force aircraft. The operation was successfully completed last July. Red Scarf provided invaluable training experience in planning and executing short term deployment operations within the continental United States (CONUS); joint operations involving other commands and services; the planning and execution of maintenance and operational requirements away from home station; and in the air movement of missile components.

Selected FORSCOM armed helicopter units are participating in the Joint Chiefs of Staff directed close air support (CAS) validation study. This study is designed to test response times for immediate demands on the command and control system of the Army, Air Force, Navy and Marines for aerial delivered fires. Field tests have

CH-47s deployed coast to coast, flew 1,200 flight hours and transported more than 718 classified items from ARADCOM sites

been satellited on Brave Crew 74; Brave Shield IX; and other planned joint exercises.

Training preparations have been extensive, particularly for the Brave Shield IX exercise, since the major maneuver unit was a Reserve Component unit and not accustomed to working with attack helicopters.

Members of the 4/77 Aerial Field Artillery Battalion, 101st Airborne Division (Air Assault)—the unit providing the attack helicopters—worked closely with the personnel of the 256th Infantry Brigade (Separate), Louisiana Army National Guard, to familiarize and provide guidance to the brigade in the employment and control of attack helicopters.

Both Red Scarf and the close air support validation effort provided excellent training experience for the aviation unit and the individual aviator.

FORSCOM's major aviation problem areas center largely around personnel and equipment.

There is a significant shortage in the hard skill aviation military occupational specialties (MOSs)—a problem which is beginning to impact severely on unit readiness. Figure 4 depicts the active Army situation in the enlisted skills as of 31 July 1974. The first two columns depict the percent fill measured against authorized levels for the active Army and FORSCOM, respectively. The last column depicts the percent fill of skill level 20 or the maintenance ranks. The situation continues to deteriorate. Until personnel can be recruited and trained to fill these requirements, commanders must rely on supervisors to assist in accomplishing required maintenance.

The officer ranks have similar shortages in certain MOSs. A late spring study of the status of AH-1 HueyCobra aviators assigned to FORSCOM disclosed a shortfall of 192. Some improvement was projected with a shortfall of 161 by the end of August 1974. While last spring's study disclosed a substantial number of Cobra aviators not being utilized in Cobra flying positions, only a small number were available for reassignment to Cobra units.

Various factors preclude the mass reassignment of Cobra qualified aviators within the command. Many are assigned to ground duty or to other critical aviation positions; i.e., CH-47/CH-54 pilots, aviation safety officers, and so on. A grade imbalance further ham-

Aviation Maintenance Personnel Shortages*

MOS	Job Title	% Army-Wide	% At FORSCOM	% FORSCOM (Skill Level 20)
45M	A/C Armament Subsystem Mechanic	81	66	64
67N	UH-1 Helicopter Repairman	82	77	67
67U	CH-47 Helicopter Repairman	84	75	69
67Y	AH-1G Helicopter Repairman	90	76	69
68D	A/C Powertrain Repairman	73	56	52
68E	A/C Prop & Rotor Repairman	69	59	55
68G	Airframe Repairman	71	60	58
68H	A/C Hydraulics Repairman	75	57	52

* As of 31 July 74

Figure 4

pered efforts to solve the problem from trained resources. About 380 of those qualified and not assigned to Cobra units were in the grade of captain or above, whereas the requirement is for warrant officer and lieutenant aviators.

Some improvement has been made but there exists a continuing shortage of qualified Cobra aviators. The inability of the Department of the Army to increase quotas at the Aviation Center for Cobra transition during FY 1975 and the planned activation of a second attack helicopter squadron in the separate Air Cavalry Combat Brigade at Fort Hood, prompted FORSCOM to authorize local Cobra transition at Fort Hood. Additionally, TRADOC has authorized local transition at Fort Knox to alleviate shortages there.

With respect to equipment, a serious shortage exists in air traffic control (ATC) major items. Get well dates are not firm and only estimates are available. The outlook, however, is bleak.

The TSC-61A, a mobile flight coordination center, is a new item. A total of eight are currently in the Army inventory and 21 are on contract and due off the line the fourth quarter of FY 1976. Of the 21, five are programed for CONUS requirements. Follow-on procurement will bring total Army assets to 51.

No new production is scheduled for the Mobile Aircraft Control Central, TSQ-70. Requirements are being filled from overhaul and FORSCOM is scheduled to receive nine TSQ-70s by the first quarter of FY 1976.

The availability of the mobile terminal radar, TSQ-71, again, is dependent upon the overhaul program. FORSCOM is expected to receive five during the second half of FY 1975.

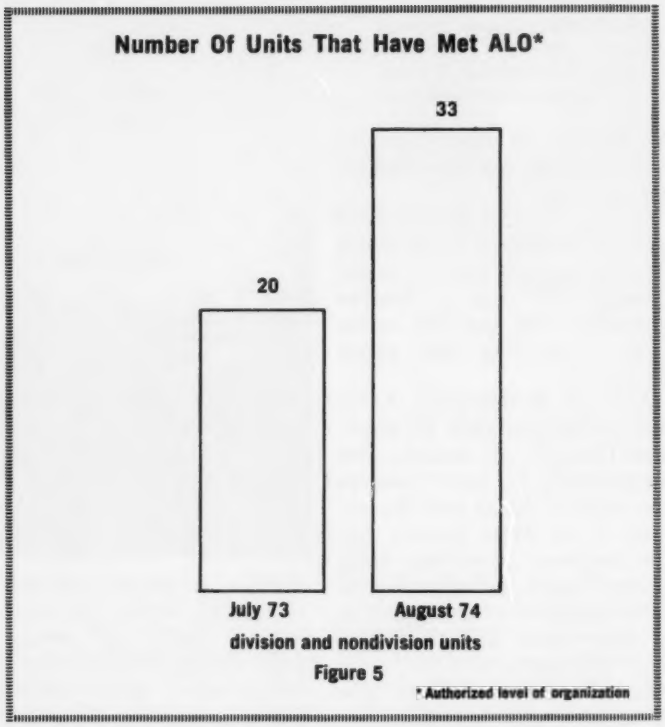


Figure 5

Units At C-4

Unit	Reason	Get Well Date
155th Attack Helicopter Company	Exception unit	Has personnel and equipment
235th Attack Helicopter Company	New organization EOH*	November 74
478th TC Company (Heavy Helicopter)	Personnel	December 74
1/9 Air Cavalry Squadron	Reorganized 21 June 74 EOH	October 74
238th Attack Helicopter Company	Personnel	Unknown
7/1 Air Cavalry Squadron	EOH	November 74
661st TC Company (GS Maintenance)	Personnel	Unknown

Figure 6

* Equipment on hand

Shortages of these major items of equipment continue to impact on ATC training and the capability of Army elements to provide responsive and effective air traffic control in the joint arena.

In spite of the personnel and equipment problems discussed here, FORSCOM aviation units have come a long way since July 1973 in attaining training readiness goals. Figure 5 depicts the progress of aviation units as they progressed toward higher readiness conditions from July 1973 to August 1974.

REDCON (readiness condition) reflects only a *part* of the picture. The *true test* lies in the *demonstrated capability* of the unit to provide responsive aviation support to the ground commander through field exercises and successful completion of Army training tests and operational readiness training tests. This capability will be closely scrutinized in the coming months.

View From The Training Base

Continued from page 9

Subjects presented during phase 1 are common to the production of a well-rounded IP, to include the expertise required of an instrument examiner. *Note* the liberal application of SFTS time within this phase.

Phase 2 addresses the critical need for IPs qualified to teach tactics and terrain flight techniques.

Phase 3 will validate the aviator's proficiency in the specific platform from which he will instruct. Most importantly, when an aviator completes this program there is no requirement for him to return to Fort Rucker for subsequent qualification as an IP in another type aircraft.

Interestingly, a survey of the IP force at Fort Rucker revealed that the mean number of separate IP courses which an IP has attended was seven. Under this proposal we will not have an IP returning to Fort Rucker to upgrade his qualification rating every 2 or 3 years. Rather he will be trained for instructor duties just once and be capable of repetitive utilization for instructing in the academic, safety, instrument and contact/tactics/terrain flight subject areas. We then will depend on the worldwide aviation standardization program (figure 11) to disseminate the new training concepts—concepts that will be carried to the field by: new graduates, new IPs, training literature, standardization and safety assistance visits and the development of comprehensive Army training and evaluation programs.

We are convinced that our Center's aviation training program is a truly dynamic program because it effects a continuous review of current doctrine, tactics and techniques and identifies areas requiring change. Thus it is in close and continuous coordination with the proponent branch for these aviation units to determine their recommendations.

We believe that we must graduate a quality product, evaluate his performance individually and collectively through a comprehensive Army training program. We then modify our programs to meet the needs of the user, for this is the justification for our existence.

The Aviation Center is aware that aviation training is costly; we constantly seek and employ cost-reduction measures. We await, with great anticipation, the receipt of better simulators and continue to ensure an active dialogue with commanders, testers, operators and other trainers in meeting those Army aviation training requirements that support the acceptance of Army aviation as an integral member of the combined arms team.

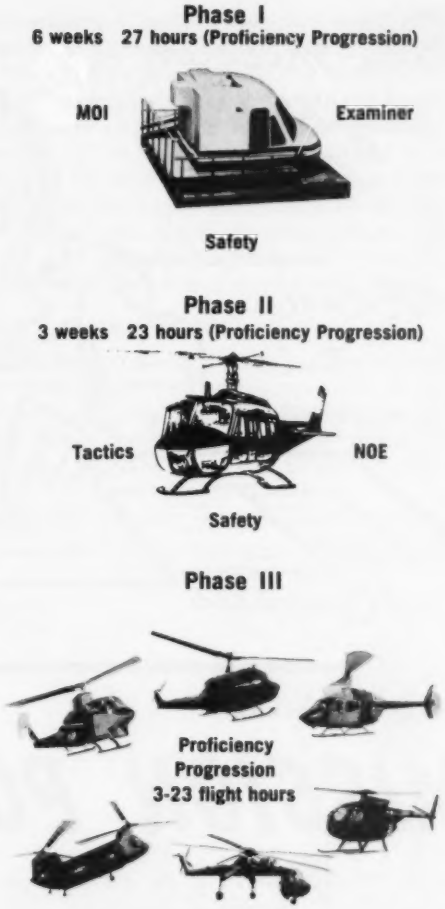


Figure 10

Figure 11

Major Chester Goolrick

MISSION POSSIBLE SENSE

BACK IN THE DAYS of the war in Korea, an aviation unit adopted as its slogan: "We Fly When the Ducks Are Grounded."

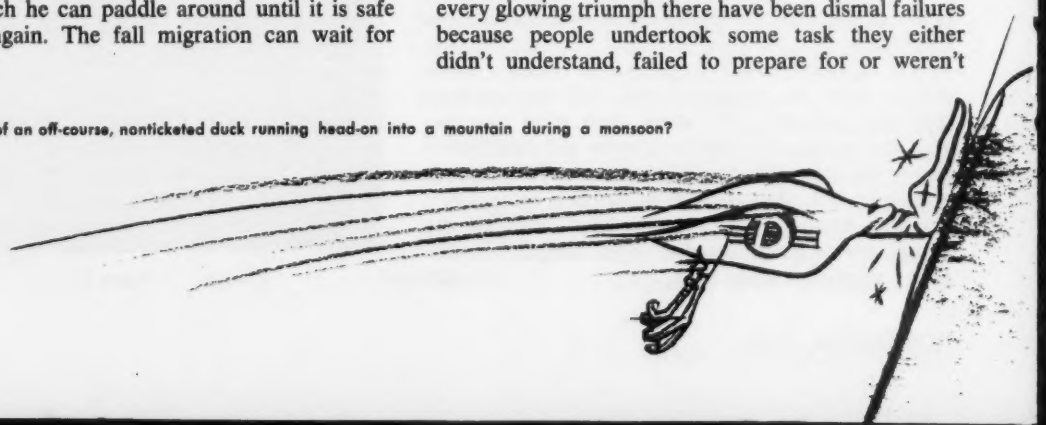
Ah, so. Stout chaps, those. The kind who are always ready to tell you they can get any job done come hell or high water.

On the other hand, who ever heard of an off-course, nonticketed duck running head-on into a mountain during a monsoon? When a duck reaches the sensible conclusion that things are considerably more hairy than he can handle, he looks around for the nearest pond on which he can paddle around until it is safe to take off again. The fall migration can wait for another day.

There is another tired old slogan you see on people's desks: "The difficult we do immediately. The impossible takes a little longer." Considerably longer.

Few people ever undertake what is clearly impossible *provided they stop to give it some hard-nosed, mature thought in advance.* It may turn out, too, that a problem which looks impossible at first glance can be cracked if you think about it long enough. After all, Mount Everest finally was climbed. Men have walked on the moon.

That's the bright side. There's a dark one. For every glowing triumph there have been dismal failures because people undertook some task they either didn't understand, failed to prepare for or weren't



Who ever heard of an off-course, nonticketed duck running head-on into a mountain during a monsoon?

able to do in the first place.

As often as not it wasn't their fault. They were asked or ordered into waters so far over their heads they sank without a trace.

IF IT'S WORTH DOING . . .

. . . It's worth doing in bang-up style, right? Take the case of Army aviation missions. Anything—repeat, *anything*—can be fouled up by just one man doing the wrong thing in the wrong place at the wrong time. It doesn't matter whether he is the top man on the totem pole or the poor Joe at the bottom holding everybody else up. If he is unequal to his assigned task, fails to give it the attention and planning it demands, isn't properly briefed as to what the mission is all about, or allows haste and distraction to interfere with proper execution, the result is almost certain to be a can of worms which could best be given the code name Operation Total Loss.

But let's take it as a matter of faith that self-pride alone makes every aviator anxious to do his job well and also that everybody is responsible enough to want to see it through to a successful conclusion. No argument, there. At the same time, let's face the fact that not every mission comes up smelling like roses. Things go wrong which, by rights, shouldn't. How come?

One easy answer given in the Republic of Vietnam —but not always the correct one, by any means— was that in combat, aviators, like everyone else, sometimes were forced to undertake assignments with considerably less than the comfortable safety margins normal prudence called for. In the heat of battle, extraordinary risks had to be assumed. There were times when the gamble failed to pay off. It is also true that in 'Nam, as in every war, overaggressive commanders on occasion made sitting ducks out of aviators in their attempt to carry out missions of dubious value which probably shouldn't have been attempted in the first place.

This isn't the sort of thing which happened every day. It serves to demonstrate, however, that if there is a gap in communications or understanding anywhere along the line in mission conception or planning, the operation can be in deep trouble from the start.

That's one important side of mission planning. Another pitfall in the same area comes as a result of what expert marketing managers call "impulse buying"—the kind of shopping binge which can fill a grocery basket with unneeded items and shoot a month's budget to shreds in a matter of minutes. Impulse missions are a good deal worse. A typical one took place on a dark and stormy night when two aviators of limited experience were ordered on a medevac mission to pick up two injured soldiers in the hills. You probably won't be surprised to learn that on the way back they flew into a hill and nobody aboard ever returned to base. The ironic fact was that one of the men they picked up had a broken arm and the other was suffering from a minor cut. Both could have waited until daylight—and survived.

Needless losses of this sort stand as tragic testimony to the fact that *a failed mission is worse than no mission at all*. Sometimes much, much worse.

USED CAR WARRANTY

How can you guarantee the success of any mission? You can't, of course. In any operation in which a number of fallible human beings are involved, so many things can go wrong nobody would want to bet there won't be some sort of monumental snarl before the day is out.

But what the heck, just about everything involves

Just about everything involves an element of risk. You can get into some kind of deep trouble just by strolling down to the post office to buy a stamp

an element of risk. People manage to break their necks just by taking a shower in their own bathroom.

Just the same, risks can be cut down to the bare bone, and where Army aviation missions are concerned, the place to start the whittling process is at the command and planning level. In fact, mission planning and supervision are essential parts of a

sound management program. An aviation unit can no more do without these professional tools than Jack Nicklaus could his golf clubs. Good management is a whole way of life and a good one at that.

What goes into sound planning will differ in detail and volume depending on the mission, but planning is planning. You touch all the bases.

Aside from the painstaking blueprinting for the mission's execution, there is the matter of analyzing the mission itself. Is it really necessary or even worthwhile? Have alternate courses of action been considered? Has everything that could be done to identify and evaluate the hazards involved been done? Has everything that can be done to reduce and control the risks been done? Does everyone have a thorough understanding of the mission and the risks involved?

If all systems show the green light at this point, the next hurdle comes with the business of carrying out the mission, which is a little like saying that once you have read the simple instructions all you have to do is to fit the pieces together to build yourself a Rolls-Royce in your basement.

The truth is that once the whistle blows, the risks start coming at an aviator like a gang of downfield

tacklers zeroing in on a punt returner. If he doesn't handle the ball with professional slickness, he knows he will end up face down on the turf under a half-ton or so of enemy linemen. If an aviator falls down on the job there's a good chance he may find himself under a couple of tons or so of thoroughly junked helicopter.

SIC 'EM TIGER

Everybody who has been in the Army long enough to draw his first paycheck knows that enthusiasm for flying is part of every successful aviator's makeup. He takes pride in his job and he wants to do it well. Nobody is going to argue with this healthy attitude.

As long as it stays healthy, that is. It starts getting a little green around the gills when it is carried the one fatal step into overenthusiasm, to the point where a man's professional pride is transformed into his desire to demonstrate to anybody around—and sometimes himself—how good he really is.

Any aviator who manages to slide into this dangerous state is a large package of *real* bad medicine. Accident prone? He's loaded for bear as far as accidents are concerned, that's for sure, and unless he is disciplined or grounded, he will wind up a short but thrill-packed career.

There is something else equally capable of gumming up the works of any mission and that's pressure, or stress, or tension or whatever you want to call it.

Too large a slug of 100-proof Old Gung Ho can psyche a man up to the point where he is a menace to himself

If an Army aviator falls down on the job, there's a good chance he may find himself under a couple of tons or so of thoroughly junked helicopter

Every worthwhile enterprise has some sort of goal, and a man working toward a goal with only a fixed (and not always as much as he wants) time to do it in is a man working under pressure.

If an aviator is carrying an overload of pressure, he is a good deal more likely to make a big mistake than the carefree soul who has nothing to do and all day long to do it in.

HEAT OF BATTLE

A fair amount of enthusiasm, and the excitement which simulated combat or other types of missions induce, is not only unavoidable but is desirable. Even a simple undertaking such as a cross-country training flight is more likely to have a happier ending if it is approached by an aviator who has an enthusiastic rather than a ho-hum attitude. The point is to adjust the enthusiasm to the point where it constitutes a blessing rather than a burden.

Here's where a good management and supervisory program comes back into the picture. Planning a unit mission is management's job, but before the blades begin turning, the razor-sharp execution required to reach the assigned goals becomes management's principal concern.

MISSION POSSIBLE SENSE

Basically, it comes down to rigid insistence on strict by-the-book procedures plus a constant surveillance designed to spot and correct the aviator who is about to be swept off his feet by his own emotions the way Romeo was the first time he laid eyes on the fair Juliet.

At the heart of every worthwhile management program is the realization that the ultimate goal is the successful completion of missions. That's pretty much what military aviation is all about—whether it is the deadly business of combat, rescuing stranded people in flooded disaster areas, ferrying aircraft or countless other tasks an Army aviator can expect to be called on to perform. Nobody knows what the call will be tomorrow, but it's good sense to be prepared for anything.

No easy task, that. Mission Impossible, you might say. Not at all. Sure, you could worry yourself into premature old age by trying to put down in black and white everything the future holds, but the kind of horsesense most of us are born with keeps us from such idiocy. Instead, we prepare ourselves by learning, and learning well, and sticking by accepted, standard procedures which have stood the test of time in and out of the heat of battle.

And that's what a mission-conscious management program's training is built around. Good training makes for good flying habits.

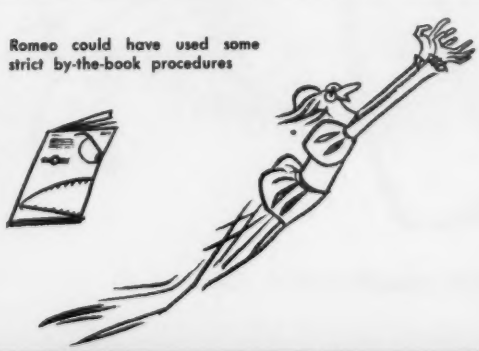
LONE EAGLE

Once the blades start going around, every Army aircrew is a team functioning on its own to a marked and critical extent. A coach can't take the field with his team. The best management and supervision in the world can go only so far. After that, the success of a mission depends on the self-discipline, skills and judgment of the men in the aircraft.

Out in the field, pilots are likely to have a total leeway in the matter of exercising their judgment about whether to go or not to go and what to do or not to do in a particular situation. If their training has been thorough and if they are safety-conscious and disciplined enough not to allow misplaced enthusiasm, tension or simple fatigue to override their skills, they'll come through with flying colors. One lapse in any direction can set off a chain of events which will bring their well-planned mission to a dismal end.

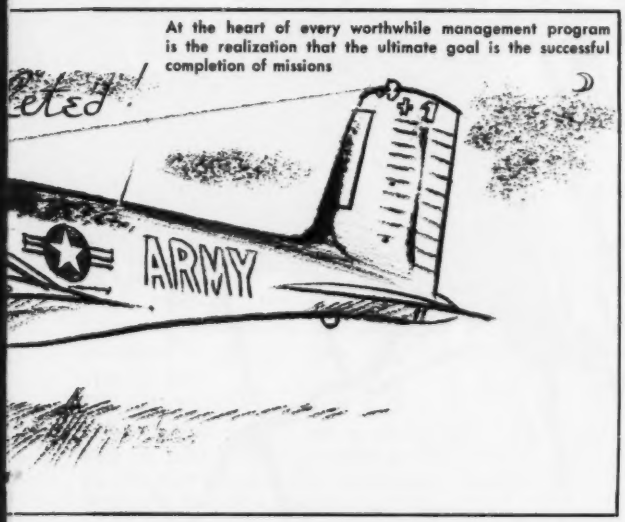
Take the matter of fuel management. A simple matter, to be sure. Yet you might be surprised to know how many missions fail because the fuel tanks went dry at the worst time, the way a motorist who

A man working toward a goal with only a fixed (and not always as much as he wants) time to do it in is a man working under pressure



Romeo could have used some strict by-the-book procedures

If commanders and aircrews are mission conscious enough not to allow mistaken enthusiasm, tension, or simple fatigue to overcome their skills, they'll come through with flags flying and the band playing



At the heart of every worthwhile management program is the realization that the ultimate goal is the successful completion of missions

should know better always manages to run out of gas 5 miles from the nearest filling station.

Or the missions which come to grief simply because a weary crew, taking honest pride in a long day's work well done, failed to remember that no flight is at an end until the aircraft is safely on the ground and the engine is shut down. A man who is looking forward to an evening of rest and relaxation involving a thick steak and perhaps a few short beers is ripe for a last-moment letdown which will make his evening turn out a good deal differently from what he had hoped.

ALL IN THE FAMILY

Every Army aircraft mission involves the skilled services of a considerable number of men. The fact that nearly all missions are successfully completed is testimony to the generally high level of management programs, supervision, unit training and individual responsibility of crewmembers and maintenance personnel. That's just the way things should be.

The silver lining, you could say. Less shiny is the fact that missions sometimes do fail and the cause can be traced to an error somewhere along the line committed by men trained to know better. Commanders or subordinates, senior pilots or young aviators just out of flight school—statistics prove that nobody carries a gold-plated card guaranteeing he won't be the one who will bring the next mission to an untimely end.

It's something to think about. Think about it while you are planning, or executing, your next mission.

Think Mission all the way.

It's almost a fulltime job. If you do it well, the life you save may be just about anybody's.

USAAAVS

take a minute for aviation safety

the interview

a one-act play

CAST OF CHARACTERS
(in order of appearance):
INTERVIEWEE
INTERVIEWER

SCENE: A fairly large, windowless, well-lit office. There is one desk, covered with thick manila folders and overflowing in-baskets. All of the walls visible to the audience are covered with large charts. Lines on the charts depict fluctuating but extremely high trends. The charts are unlabeled. As the curtain rises, Interviewee is alone, adding segments to each trend line on the charts while consulting various papers. He is wearing a Nomex flight suit, but no rank or rating is visible to the audience. After several moments of activity, there is a knock on the door at stage left.

INTERVIEWEE: Come in.

Interviewer enters. He is also dressed in Nomex with no rank or rating visible to the audience.

INTERVIEWER: I'm here for the interview.

INTERVIEWEE: Well, start interviewing.

INTERVIEWER: OK, I'll start by asking what you are doing now.

INTERVIEWEE: I'm posting my charts. (He walks around the room, vaguely pointing to charts as he talks.) This chart shows fatalities, this shows procedural accidents and here's dollar loss. This one's blade strikes. Over here's ground accidents. I have all the facts and figures for all the Army aviation accidents since year 1.

INTERVIEWER: That's great. What do you do with them?

INTERVIEWEE: I post 'em on these charts here.

INTERVIEWER: What else?

INTERVIEWEE: That's all, just post 'em. Keeps me plenty busy, too. Just look at my in-box.

INTERVIEWER: I see. I guess what you are doing really helps the aviation safety program, huh?

INTERVIEWEE: Oh no. I just post the charts. I gripe a lot, but really, no one cares. They say they care, but they don't, really.

INTERVIEWER: What do you mean, "they don't care?"

INTERVIEWEE: I'll give you an example. Not long ago a Huey piled up on takeoff. No one hurt, mind you, but anyhow, the helicopter was on a routine flight and while moving from the pad to takeoff it hit the ground and tore everything up. They had an accident investigation and one of those collateral investigations and they said it was caused by improper technique by the pilot. They gave the pilot a postaccident checkride and said he had no bad flying habits. Actually, he caused that accident because he was cowboying the bird around. But no one would tell it like it was and condemn one of their own, so he is still flying today. They just don't care!

INTERVIEWER: But that's just one example.

INTERVIEWEE: Yeah, but does the accident sound familiar? And the results, aren't they familiar? I tell you, they don't care.

INTERVIEWER: Perhaps they don't, but that's just one example.

INTERVIEWEE: OK, here's another. They keep telling us to wear the survival vest, right? Saves lives, right? It's the thing to wear, right? We have had an order in for these vests for over 9 months. We've checked, followed up and everything. No survival vests. I don't think we're alone. And then there is a VIP flight detachment that has written instructions forbidding them to wear Nomex when flying 0-6 and above. Doesn't look good, they say. I tell you, they just don't care.

INTERVIEWER: OK, so they don't call a spade a spade in accidents, and they don't demand that we wear the proper equipment. I don't think that means they don't care.

THE INTERVIEW

INTERVIEWEE: Here's another. I was chewing the fat with a Chinook pilot the other day. Somehow the subject came up about DA Form 365Fs. He didn't know what a Form F was. I told him and he said something about their being on file. Said he never had to compute weight and balance. Hadn't computed weight and balance since an annual writ several years ago. Weight and balance questions haven't been on the writ lately, so he guessed it wasn't important. So even though the regs say to compute weight and balance they don't care if you do or not.

INTERVIEWER: I guess it isn't important if it isn't on the annual writ.

INTERVIEWEE: Oh, it's important, all right. It's just that they don't think the annual writ is too important. If you fail it, all you have to do is take it over until you pass it. How many jocks have been grounded or put before a Flight Evaluation Board because they failed the annual writ? They don't realy care about it.

INTERVIEWER: I still don't see what you are upset about.

INTERVIEWEE: How about this? I was visiting a unit that flies a bunch of U-8 aircraft and do you know only one pilot used the DA Form 2283? No one else even knew what it was. Back when I was a standard ticket aviator, our operations officer wouldn't even look at a proposed flight plan unless he saw the DA Form 2283. They just don't care anymore.

INTERVIEWER: Big deal. What's so important about a flight log?

INTERVIEWEE: At least you know what it is. The "big deal" is that no one uses them. And speaking of using them, how many aviators do you know who have a complete and current dash 10 for every aircraft they are current in? I don't know a single one, and I know lots of aviators. Sure, some SIPs and IPs have some, but not all. Everyone knows they should have 'em, but they don't care if they do or not.

INTERVIEWER: But isn't it impossible to ensure that everyone has all the latest changes and stuff?

INTERVIEWEE: No, it isn't. You're too young to remember the days when each and every aviator had his own subscription to the Jeppesen Manual, complete with the weekly revisions. Sure it was expensive, but just how much does it cost to bury a dead aviator? It would be a lot of trouble to set up, I guess, but wouldn't it be a great way to ensure each man got the word—all the time? I know this isn't a new idea, but they don't care enough to see it through.

INTERVIEWER: That's one point, but there must be others.

INTERVIEWEE: There's a lot more. Ever see a crewchief so tired from guard duty, or KP, or something not related to his aviation duties that he pulled a bad boo-boo? Everyone knows that the maintenance types are worked to the bone, and become error prone. But they don't do anything about it. They don't care.

INTERVIEWER: But you'll have to admit Army aviators are a pretty professional bunch.

INTERVIEWEE: Oh? I was chewing the cud with an Air Force weather forecaster whose detachment gives an Army airfield its weather support. He said that his assignment was the most unrewarding one he ever had. He felt that Army aviators never really listened to him, never gave PIREPS and didn't really understand all he tried to tell them. They just don't care.

INTERVIEWER: But that's just one man's opinion.

INTERVIEWEE: Yes—just one man's. But there had been two recent accidents involving aircraft based at that airfield. Both accidents were directly caused by weather that was forecast. They just don't care.

INTERVIEWER: OK, I guess you're right. (Glances around room, looking at the charts.) Those lines are sure high on those charts, aren't they?

INTERVIEWEE: Yes, they've been high since year 1, and they'll stay high, 'cause they don't care.

INTERVIEWER: (Starts for door, opens it, steps out.) Thanks for the interview. (Closes door behind him.)

INTERVIEWEE: He didn't even ask who "they" were.

CURTAIN

EROSION OF T53 SERIES GAS TURBINE ENGINES

Clarence J. Carter
Directorate for Aircraft Accident Analysis and Investigation

USAAAVS

RECENTLY, A TEAM from the U. S. Army Aviation Systems Command (AVSCOM) inspected T53 series gas turbine engines at a post in the eastern part of the United States. The following conditions were noted:

"UH-1H aircraft flying 'slick' or troop-carrying missions have been subject to erosion of the compressors and some engine stalls. This is due apparently to flying into unimproved landing zones of fine sand.

"AH-1 and UH-1 gunships fly off of prepared surfaces and consequently do not experience the compressor erosion and subsequent compressor stalls.

"Three engines were examined by the AVSCOM team. The compressor blades were examined and exhibited nearly identical wear patterns. The separators and air particle swirl tubes were clean and well maintained. This cleaning should be a continuing training subject and a special item for inspection at each PMI (preventive maintenance inspection).

"Other reasons for compressor stalls were discussed along with the compressor erosion. The engines should be closely monitored for proper bleed band function, operation of the variable inlet guide vanes (VIGV) and malfunction of the fuel control, and operation in sand and dust should be kept to a minimum.

"Certain criteria were established as representative of the erosion conditions noted in engines subject to compressor stalls. These criteria may be used as guidelines in identifying engines which are candidates for compressor stalls. These criteria should not be considered as no-go indicators in authorizing return of engines to depot. These criteria are shown in figure 1.

"It may be expected that due to environmental conditions involved and to the inherent efficiency level of the existing separator (65 percent of all particles separated), engines will be returned for overhaul at less than the normal MTBD (maintenance time before depot), which is currently 730 hours."

Figure 2 shows an engine taken from an aircraft operating in the middle west. Flight time on this engine was just short of 400 hours when compressor stalls occurred at a hover. It is apparent that extensive erosion is not limited to any one geographical area. The required cure in this case is daily cleaning and inspection of the particle separator or inlet filters and a thorough visual inspection of the compressor after each day's operation in a dusty or contaminated environment.

If you have a powerplant problem requiring a crash facts message, no matter what the problem is, be sure the message contains: (1) engine serial number, (2) number of overhauls, (3) hours since overhaul, (4) hours since new, (5) hours since last installation and (6) last overhaul facility. This information will enable us to spot mishap trends as they develop. (A sample crash facts message can be found in AR 385-40, appendix D.) When an engine condition can be pinpointed to a certain hour level, series, etc., USAAAVS and AVSCOM can warn you of what to expect from your aircraft and when.

We are only able to help if you include these six items in every crash facts message concerning powerplants.

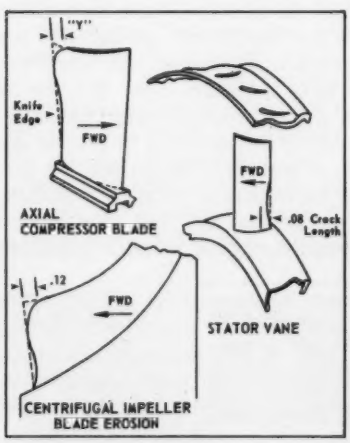
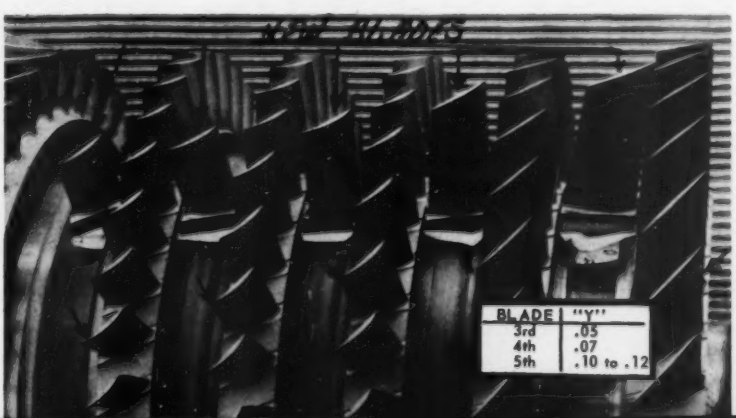


FIGURE 1

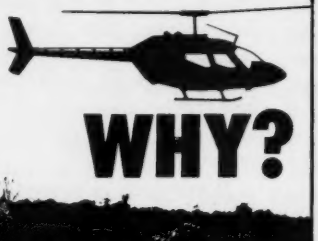
FIGURE 2



Insurance against running out of fuel is available at a very cheap premium. Its only cost is the little time it takes to compute fuel consumption before flight . . . and you'll avoid the white knuckles and shaky knees that go with operating quantity unknown

USAAAVS

QUANTITY UNKNOWN WHY?



Captain Walter L. Hinman

AN OH-58 PILOT would not believe the low fuel quantity indicated by his gauge. He had planned his flight for 3½ hours and still had approximately 1 hour to go. Even when the low-level warning light illuminated, he was adamant in his conviction that ample fuel remained. He became a believer when his engine quit after only 2 hours and 58 minutes of flight.

During a ferry flight, the pilot of one OH-58 called out to the pilot of another that his fuel gauge and lights weren't functioning properly. The other pilot replied: "That's funny. Mine are flickering also." Both aircraft ran out of fuel within minutes of each other.

Extraordinary? Not at all. These are typical examples from the numerous ones found in accident files at the U. S. Army Agency for Aviation Safety. And the problem is more serious than it seems. For example, during a 19-month period ending 31 January 1974, eight fuel exhaustion mishaps occurred. All involved Army helicopters. Five were forced landings. The other three were major accidents that destroyed two aircraft. The pilot of one aircraft was killed, and one occupant of another was injured. And these eight mishaps represent a substantial decrease in the incidence of fuel exhaustion mishaps over previous comparable periods.

With today's technological advances, why do we continue to run out of fuel? The most readily available answer is pilot error. While the pilot is not altogether blameless, he is not the sole responsible agent. In the past, training in fuel management has not received the emphasis it deserves. All too often, we have seen IPs using a blanket flight time for all missions regardless of the particular phase of training.

At the unit level, there is little or no training in this subject. Techniques of poor fuel management are carried from training environments to field operations where mission requirements and fuel consumption vary due to differences in engines, weather conditions and loads carried.

Fuel charts in dash 10 manuals are not yet standardized and, at times, difficult and time-consuming to interpret. This lack of fuel management training combined with troublesome fuel charts generates attitudes and practices conducive to fuel exhaustion mishaps.

Insurance against running out of fuel is available

at a very cheap premium. Its only cost is the little time it takes to compute fuel consumption before flight. While flight regulations state you will not run

out of fuel, they cannot physically prevent it. Only you can prevent fuel exhaustion by complying with regulations and computing fuel required to complete your mission. Charts in the dash 10 are not as out-of-sight as they might appear to be. In fact, they are a necessary tool in your profession. Want to test your knowledge? Then solve the following:

Situation: You have just received two OH-58A tactical missions requiring a gross weight (at start of cruise) of *2,600* pounds in *clean* configuration. OAT at a cruise pressure altitude of *8,000* feet is 20 degrees C. No winds. Crashworthy fuel tanks are full. In this hypothetical situation, we will require an average 25 pounds of torque for 8 minutes and 50 pounds for 2 minutes at msl (0 feet) to compute engine start, runup and hover to takeoff pad. To complete the two missions, you need to know the answers to the following questions:

1. What is your long-range cruise (LRC) airspeed?
2. What is your LRC flight time?
3. What is max range (no wind)?
4. What is your max endurance (ME) airspeed?
5. What is your ME flight time?
6. What is the distance difference between max range (LRC) and ME range?
7. If while cruising at airspeed in question No. 1, you found your fuel state lower than expected, would you increase or decrease your airspeed to better your chances of making your destination?
8. Suppose that just prior to takeoff, two unexpected passengers (combat soldiers) climbed on board, increasing your gross weight to 3,000 pounds. While remaining within dash 10 operational limitations, how will this additional weight affect the answers to questions 1 through 5?
   a. Did this added weight increase or decrease your LRC flying time? ME flying time?
   b. Did it increase or decrease your LRC range? ME range?

Answers:

1. 93 KTAS
2. 3 hours, 10 minutes
3. 294 NM (less wind)
4. 52 KTAS
5. 4 hours, 03 minutes
6. LRC range is 83 NM greater
7. Airspeed remains the same (one exception noted)
8. 79 KTAS; 3 hours, 17 minutes; 259 NM
   57 KTAS; 3 hours, 37 minutes
   a. LRC time increased; ME time decreased.
   b. LRC range decreased; ME range decreased slightly.

If the correct answers were obtained using figures 14-12 through 14-36 in TM 55-1520-228-10, congratulations. However, if you had any difficulty, let's figure the problem step by step:

Step 1—Refer to the dash 10, figure 14-23 at bottom of page 14-29 and go up the left column to 2,600 pounds, then across to the 8,000-foot slanted line. Project this intersection vertically upward to read 0.695 nautical miles (NM) per pound (lb) of fuel.

CPT Hinman, a dual-rated aviator, is a graduate of the USC Aviation Safety Officer's Course, the NTSB National Aircraft Accident Investigation School and the USAAAVS Aviation Accident Prevention Course. He was assigned to the Directorate for Aircraft Accident Analysis and Investigation, USAAAVS, when he wrote this article. He is presently serving with the Joint Resolution Casualty Center in Thailand.

Step 2—Move up to airspeed chart immediately above and project vertically along the 0.695 NM per lb line to the baseline of airspeed curve. Move left horizontally to read *103.5* knots (K) on the true airspeed scale. This is your LRC airspeed (without operational limitations considered).

Step 3—Due to aircraft weight and temperature, the LRC speed may exceed aircraft limitations. Refer to figure 14-27, lower right-hand 20° chart. Read up the curved line of 2,600 lbs to 8,000 feet and project this intersection vertically down to read 93 KTAS max speed. Your new LRC speed is *93 KTAS.*

Step 4—To determine the new mileage per lb of fuel for the new LRC range, return to figure 14-23. Project the old 0.695 intersection with baseline (center chart) vertically upward and parallel to the curved flow lines to the new LRC speed of 93K. Read new NM per lb of fuel as *0.700.* (Note: As the airspeed decreases to a more efficient point, NM per lb of fuel increases, but if the airspeed decreases past the most efficient (LRC) point, NM per lb of fuel decreases while flight endurance time may be increased.)

Step 5—To find fuel flow per hour, go to the top chart on figure 14-23. Move up the .7 vertical line to 93 KTAS. From this intersection move horizontally left to read *132* lbs per hour for fuel flow.

Step 6—Determination of max flying time at LRC airspeed is as follows: Multiply 6.5 lbs x 70.3 gal = *457* lbs of usable fuel available at engine start. Start, runup and hover to takeoff fuel consumption varies with the situation. Note the requirement for an average 25 lbs of torque for 8 minutes and 50 lbs for 2 minutes at msl (0 feet) to complete engine start, runup and hover to takeoff pad.

a. Enter figure 14-6 on vertical slant line of 0 pressure altitude, moving up to the 25 lbs of torque horizontal slant line and read across to 110 lbs per hour. Operating time required is 8 minutes or $\left(\frac{110 \text{ lbs x } 8 \text{ min}}{60 \text{ min}}\right)$ equals *15 lbs* of fuel.

b. Go up to the 50 lbs of torque line and read 150 lbs per hour. This consumption is required for 2 minutes or $\left(\frac{150 \text{ lbs x } 2 \text{ min}}{60 \text{ min}}\right)$ equals *5 lbs* of fuel.

c. Total fuel used from start to takeoff is *20 lbs.*

d. Fuel required to climb to 8,000 feet altitude is found on the chart at the top of figure 14-14. Move vertically up the 8,000 ft. line to 2,600 lbs curve line. At this intersection, read horizontally across to *20 lbs* of fuel required.

e. A total of *40 lbs* of fuel is required from engine start to cruise altitude.

f. Total fuel available 457 lbs minus 40 lbs equals 417 lbs divided by LRC consumption rate of 132 lbs per hour equals 3.16 hours or *3 hours and 10 minutes* flying time available once cruise altitude is reached. However, *don't* believe it will fly over 3 hours tomorrow unless *exact* conditions are duplicated.

g. Max range is computed by taking 93 KTAS x 3.16 hours equals *294 NM* at cruise altitude plus or minus wind conditions en route. If winds existed, they must be computed to make your max range more realistic. (Note: If strong headwinds exist, airspeed should be increased in order to depart the hostile environment more quickly, thus increasing max range by reducing exposure time. Conversely, airspeed should be reduced with strong prevailing tailwinds so as to remain within the favorable wind conditions longer, thus covering more ground with less fuel used. To determine if an airspeed change would be beneficial, you should calculate the loss in helicopter system efficiency (that would result by changing airspeed above or below its more efficient point) to the distance/time gained by the efficient use of prevailing winds. In some cases, system efficiency may not outweigh wind efficiency depending on wind velocity and amount of area affected.) When flying max range, it is important to be continually aware of changing winds, altitude, weight, etc., throughout the flight, and that a revision of your max range may be necessary due to these changes. Don't forget to subtract 30 minutes flying time (VFR fuel reserve) for the actual flight.

Step 7—Max endurance airspeed is determined by entering the center chart in figure 14-23 and reestablishing the intersection of 0.700 NM per lb and 93 KTAS. From this point, project vertically and parallel to the curved flow lines until the max endurance (horizontal) line at top of chart is reached. ME airspeed is *52 KTAS* and the new corresponding range is *0.500 NM* per lb of fuel.

Step 8—To determine ME flight time available, use the chart at the top of figure 14-23 and Step 9. Go up the vertical .5 NM per lb of fuel line to the 52 KTAS curve line and read horizontally across to a fuel flow of *103 lbs* per hour.

Step 9—Total fuel available 417 lbs (once altitude is reached) divided by the above fuel flow of 103 lbs per hour equals 4.05 hours or *4 hours and 03 minutes* of flying time available once an altitude of 8,000 feet is reached.

Step 10—To find ME range, simply multiply 52 KTAS (answer No. 4) by 4 hours 03 minutes (answer No. 5) which equals 211 NM. Compare this

answer to the max range of 294 NM (answer No. 3); max range is *83 NM* greater than ME range.

Step 11—If you find your fuel state low, you should land as soon as a safe area is available. But if the mission requirements demand otherwise, you should not increase your speed above the LRC airspeed, as the ratio of miles per pounds will only decrease. Beware, there is a tendency to hurry up and get to your destination. Since the miles will be going by faster, you will arrive before your planned ETA. But while your flight plan indicates plenty of fuel at or before this planned time of arrival, the actual rate of fuel consumption has drastically increased over miles per hour gained, because you have actually decreased the efficiency of your helicopter's system. Consequently, your planned range for fuel available has decreased accordingly. Nor will it benefit you to slow down below LRC airspeed because as the time-per-pound ratio increases, the miles-per-pound ratio decreases. So your airspeed in question 6 will remain the same—93 KTAS. There is one exception: You may elect to increase to 103.5 KTAS, since this is your true LRC airspeed (but due to operational limitations, it was decreased to 93 KTAS). If the situation or mission dictates, you may desire to exceed these limitations and fly the 103.5K for the greater distance. With a few hundred less pounds of fuel on board, you could speed up a little without exceeding the limitations of your aircraft.

It can be readily determined that there is almost an hour difference in flying time between LRC and ME airspeed. Peculiarly, you can remain airborne an hour longer at ME airspeed, while your distance traveled is 83 miles less than at LRC airspeed. It will depend on your mission whether you will desire to remain airborne for a longer period of time per pound of fuel or wish to make more distance (miles) per pound of fuel. The important thing is to realize that there is a difference and to adjust your airspeed/fuel flow accordingly. Note that fuel consumption is a function of power required (torque). Although you may have flown 3½ hours yesterday in the same bird without refueling, today you may be able to stay airborne only 2½ hours because of weight, altitude, atmospheric conditions and mission (airspeed). Most important, NEVER fully rely on a full gauge indication but ALWAYS believe the empty gauge and low fuel (20-minute) warning light. (Is there really 20 minutes flying time left when this warning light activates? There may or may not be, depending on the many variables mentioned earlier.) Land as soon as feasible to settle the argument between the gauge and your watch. Right or wrong, you are still alive and your bird is still in a flying configuration.

Step 12—To determine the effect of two additional passengers (combat troops) on your mission, use the same procedures in Steps 1 through 10 but substitute 3,000 lbs for 2,600 lbs when applicable. In figure 14-23, NM per lb of fuel is reduced from 0.695 to 0.620 (Step 1). Your new LRC airspeed is *79 KTAS* due to limitations found in figure 14-27 (Steps 2 and 3). New range per pound of fuel is 0.615 NM (Step 4). It should be noted that once the efficiency point for distance is passed, NM per lb of fuel decreases. Corresponding fuel flow is 126 pounds per hour (Step 5). For brevity, Step 6 will remain the same but it should be noted in actual flight that slightly more torque (increased fuel flow) would be required to taxi, take off and climb to 8,000 feet due to the increase in weight. Thus, slightly more than 40 lbs (estimate 4 lbs) of fuel would be required. However, let us assume 413 lbs of fuel are available at cruise altitude, which is safe-siding this hypothetical situation. Maximum flying time is 3.28 hours or *3 hours 17 minutes*. With the added weight, how can flying time increase? If you remain within the limitation envelope of the aircraft, you must reduce your airspeed. This happens to be in the direction of maximum endurance (fuel flow is 6 lbs less per hour). However, maximum range is decreased to *259 NM* due to the slower airspeed.

The maximum endurance horizontal line cannot be reached in Step 7 due to increased weight. The new ME airspeed is *57 KTAS*. The ME fuel flow is 114 lbs per hour (Step 8). The new ME flight time is 3.62 hours or *3 hours 37 minutes* (Step 9). Corresponding ME range is *206 NM* (Step 10). Note the increased weight has decreased your ME flying time by almost half an hour (26 minutes), yet has had little effect (5 miles) on ME range.

As an aviator you also need to know the effects of flying in dirty configurations such as with armament and/or with doors off. This problem will not be addressed here but the answers can be obtained by following the previous steps, using different charts in the dash 10. Additionally, operation with the winterization kit (reverse flow inlets) installed or with customer bleed air on should be considered. Both reduce performance and horsepower, and affect fuel consumption. The OH-58A fuel charts are currently being revised to simplify their reading and to reflect this increase in fuel consumption.

Yes, there are reasons for running out of fuel. Among them are ignorance, carelessness, laziness, haste and lack of professionalism. The cure is simple: Know your mission requirements, the capability of your bird and your own capability, and then *plan* accordingly.

CRASHWORTHY FUEL SYSTEMS
where we stand today

CRASHWORTHY FUEL SYSTEM CONVERSION SCHEDULE
(Total Percent Aircraft Completed–67.4)

	OH-6A	OH-58A	AH-1G	UH-1 B/C/M	UH-1 D/H	CH-47 A/B/C
Aircraft Requiring Modification	435	2,038	769	759	3,215	426
Aircraft Completed in Production	0	916	240	0	975	1
Aircraft Remaining for Modification	435	622	267	560	249	355
Percent (%) Completed	0	69.5	65.3	26.2	92.3	16.7
Modification Completed (FY)	76	74	75	75	75	76

USAAAVS
Lieutenant Colonel William F. Gabella and Billy H. Adams
Directorate for Technical Research and Applications

take a minute for aviation safety

IN MARCH 1968, General Harold K. Johnson, Chief of Staff of the Army, directed that $3 million in emergency Research and Development funds be applied immediately to develop a crashworthy fuel system for Army helicopters. General Johnson (now president of the Freedoms Foundation) recently told us that his action was generated by the concern expressed to him by various Army field commanders during a trip to the Republic of Vietnam in the spring of 1968. Of particular significance were the reports he received of aircrew and passenger personnel being either killed or seriously injured from burn trauma in what would otherwise have been survivable helicopter mishaps.

Under the sponsorship of the Chief of Research and Development, the U. S. Army Materiel Command let contracts to develop and procure a crashworthy fuel system (CWFS) for the UH-1 series helicopters which were then bearing the brunt of combat in Southeast Asia.

The contractors proposed the development of a CWFS which had three basic characteristics to nullify postcrash ignition of the UH-1 fuel load. These characteristics were:

- Minimize fuel spillage through the use of impact-resistant fuel containers.
- Minimize the dispersion of fuel through the use of breakaway fuel lines.
- Trap fuel within the major fuel containers through a series of pressure sensitive fuel shutoff valves.

A period of accelerated research, development and testing followed which was climaxed in the proof-testing of individual items of hardware for the system. Small penalties in weight and cost were deemed acceptable in view of the importance of nullifying the effects of postcrash fires.

In April 1970 the first UH-1H helicopters equipped with crashworthy fuel systems began rolling off the production line. In the next 53 months the Army had 838 accidents with CWFS-equipped helicopters with one very remarkable result—there wasn't a single thermal *fatality* or *injury*. Aircraft involved included AH-1G, OH-58A, UH-1D and UH-1H.

During the same 53-month period, the probability of postcrash fires occurring in aircraft without CWFS proved to be many times more frequent than aircraft equipped with CWFS. Seventy-five postcrash fires occurred in 989 mishaps of aircraft without CWFS (an average of one fire in 13 mishaps), as opposed to 16 postcrash fires in 838 mishaps of aircraft equipped with CWFS (one fire in 52 mishaps).

Thus far, all postcrash fires which have occurred in Army aircraft equipped with CWFS have been of the "progressive type," i.e., small localized fires, the propagation of which is delayed significantly to allow occupants to escape or be rescued.

The dramatic success of CWFS in nullifying casualties due to postcrash fires has prompted the Army to embark on an ambitious long-range program of equipping all present and future rotary wing aircraft (except the CH-54) with CWFS. In the case of the CH-54, the magnitude of engineering changes required for the relatively few numbers of aircraft has proved to be prohibitive. This is especially true in view of the excellent safety history of the aircraft.

While the overall results of the CWFS have been extremely encouraging, the Army has initiated a number of product improvement actions with respect to existing CWFS. Chief among these have been the extension of breakaway fuel lines and the incorporation of shutoff valving on the engine deck area of existing helicopters. The Army is taking action to develop and procure an additional shutoff valve—the main fuel vent valve—to prevent the spillage of large quantities of fuel in airframe rollover situations.

THERMAL CASUALTIES BY TYPE FUEL SYSTEM

	Without CWFS	With CWFS
Fatalities	101	0
Injuries	86	0

In addition to the conversion of the present fleet, all new helicopters being developed for the Army, i.e., the Utility Tactical Transport Aircraft System, the Advanced Attack Helicopter and the proposed Advanced Scout Helicopter, will be equipped at the outset with a new generation of crash-resistant fuel systems.

The long-range goal is for all Army aircraft—both rotary and fixed wing—to be equipped with crashworthy fuel systems by 1985.

CRASHWORTHY FUEL SYSTEMS

where we stand today

CRASHWORTHY FUEL SYSTEM CONVERSION SCHEDULE
(Total Percent Aircraft Completed–67.4)

	OH-6A	OH-58A	AH-1G	UH-1 B/C/M	UH-1 D/H	CH-47 A/B/C
Aircraft Requiring Modification	435	2,038	769	759	3,215	426
Aircraft Completed in Production	0	916	240	0	975	1
Aircraft Remaining for Modification	435	622	267	560	249	355
Percent (%) Completed	0	69.5	65.3	26.2	92.3	16.7
Modification Completed (FY)	76	74	75	75	75	76

USAAAVS
Lieutenant Colonel William F. Gabella and Billy H. Adams
Directorate for Technical Research and Applications

take a minute for aviation safety

IN MARCH 1968, General Harold K. Johnson, Chief of Staff of the Army, directed that $3 million in emergency Research and Development funds be applied immediately to develop a crashworthy fuel system for Army helicopters. General Johnson (now president of the Freedoms Foundation) recently told us that his action was generated by the concern expressed to him by various Army field commanders during a trip to the Republic of Vietnam in the spring of 1968. Of particular significance were the reports he received of aircrew and passenger personnel being either killed or seriously injured from burn trauma in what would otherwise have been survivable helicopter mishaps.

Under the sponsorship of the Chief of Research and Development, the U. S. Army Materiel Command let contracts to develop and procure a crashworthy fuel system (CWFS) for the UH-1 series helicopters which were then bearing the brunt of combat in Southeast Asia.

The contractors proposed the development of a CWFS which had three basic characteristics to nullify postcrash ignition of the UH-1 fuel load. These characteristics were:

- Minimize fuel spillage through the use of impact-resistant fuel containers.
- Minimize the dispersion of fuel through the use of breakaway fuel lines.
- Trap fuel within the major fuel containers through a series of pressure sensitive fuel shutoff valves.

A period of accelerated research, development and testing followed which was climaxed in the proof-testing of individual items of hardware for the system. Small penalties in weight and cost were deemed acceptable in view of the importance of nullifying the effects of postcrash fires.

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The long-range goal is for all Army aircraft—both rotary and fixed wing—to be equipped with crashworthy fuel systems by 1985.

If you have a question about personal equipment or rescue/survival gear, write Pearl, USAAAVS, Ft. Rucker, AL 36360

PEARL'S

Personal Equipment & Rescue/Survival Lowdown

Survival Radios

The aviation section of this headquarters is authorized three URC-10A radio sets on LIN Q42092 of MTOE 05-111GAR01. These radios were requisitioned on document number 4036-0100 (UIC WS47AA). This is the second time such radios have been requested.

We have an urgent requirement for survival radios as the unit's three assigned helicopters and one fixed wing aircraft operate over four southwestern states. Request information on availability of the URC-10A radio sets.

The AN/URC-10A survival radio has been re-

classified as Standard "B." The current Standard "A" survival radio is the AN/PRC-90, FSN 5820-782-5308. Survival radios and batteries are discussed by Pearl in the January 1974 AVIATION DIGEST.

The Electronics Command (ECOM) currently approves all requisitions for survival radios. ECOM is approving requests of units using an 02 priority. Recommend you cancel your requisition for the AN/URC-10A radios and requisition the AN/PRC-90 survival radios.

Clothing for Fuel Handlers

In your June 1974 issue, you included an article that made reference to safety equipment for refueling personnel. We conduct a considerable amount of hot refueling of helicopters. When we looked for some type of protective clothing for our refuelers, Nomex seemed the logical choice. So our personnel wear Nomex shirts, trousers and gloves. But I am confused after reading your article as to whether we are doing the right thing. Should our people be wearing Nomex and, if not, what specific Army uniform should they wear?

Also, would you itemize the regulations or manuals you consulted so we may study them in detail.

Common Table of Allowances (CTA) 50-900, dated September 1973, lists some coveralls in Section II, pages 20 through 22. Additionally, Department of the Army Pamphlet 385-3, dated August 1968, lists protective clothing and equipment available for fuel handlers on page 104.

The Nomex flight clothing was developed and procured to give aviation crewmembers maximum protection from thermal injury during postcrash fires. A Nomex flight uniform which has been soaked in a flammable fluid or splashed with fuel, oil or any other type of flammable fluid will *not* provide the wearer any protection from fire as long as the fluid is present in the fiber of the suit. Since fuel handlers come in contact with flammable fluid, a fuel and oil resistant type coverall is recommended.

Flight Clothing

The U. S. Army Support Center, Philadelphia, PA, Supply Information Letter No. 4-74, 1 June 1974, indicates the following items have been reclassified as Standard, LCC B:

- Jacket, Flying, Winter Weight, Type N3B, FSN 8415-269-0418(S), LIN L15115.
- Jacket, Flightline Crewman's, FSN 8415-268-7773(S), LIN L15252.
- Jacket, Flying, Intermediate Weight, Reversible, Type MA-1, FSN 8415-818-7352(S), LIN L14567.
- Jacket, Flying, Summer Weight, Type L-2B, FSN 8415-817-0595(S), LIN L14841.
- Trousers, Flyer's, Heavyweight, FSN 8415-269-0517(S), LIN X35741.
- Trousers, Flyer's, Medium Weight, FSN 8415-266-9890(S), LIN X35810.
- Coveralls, Flyer's, Intermediate Weight, Type CWU-1/P, FSN 8415-576-3399(S), LIN F32124.

Existing stocks of the above items will be issued until exhausted and no further procurements will be made.

Jacket, Flying, Winter Weight, Type N-2B, w/Natural Fur, FSN 8415-270-0367(S), LIN L14978, has been changed to Jacket, Flying, Winter Weight, Type N-2B, w/Synthetic Fur, FSN 8415-118-7569(S), based on DA decision to discontinue use of natural fur. Stocks on hand of jackets with natural fur will be issued until exhausted and no further procurements will be made. Estimated date of supply (EDOS) for the Jacket w/Synthetic Fur is 1 June 1974. Basis of Issue (BOI) is published in CTA 50-900 under LIN L14978.

The following items have been type classified as Standard, LCC A, and replace those listed above. For supply planning purposes, EDOS/anticipated availability date is also furnished.

- Parka, Insulated, Extreme Cold Weather, Type CWU-8/P, FSN 8415-890-2028(S), LIN N69886, EDOS 1 July 1974.
- Trousers, Extreme Cold Weather, Type CWU-6/P, FSN 8415-768-4152(S), LIN X35961, EDOS 1 August 1974.
- Jacket, Flyer's, Lightweight, Heat Resistant, Nonmelting, FSN 8415-217-7201(S), LIN to be assigned. Item will not be available prior to fourth quarter FY 75.
- Jacket, Flyer's, Medium Weight, Heat Resistant, Nonmelting, FSN 8415-221-8870(S), LIN to be assigned. Item will not be available prior to fourth quarter FY 75.

BOI for the above Parka, Extreme Cold Weather, and Trousers, Extreme Cold Weather, is published in CTA 50-900. BOI for the Jacket, Flyer's, Lightweight, and Jacket, Flyer's, Medium Weight, will appear in a subsequent revision.

Since no further procurements will be made of replaced items, it is recommended that maintenance be effected to afford maximum serviceability and utilization of these items at the user level pending availability of the new items.

USAAAVS recommends units survey aviation personnel and ensure all required winter flight clothing and survival equipment is on hand and in a serviceable condition.

USAASO Sez

The U. S. Army Aeronautical Services Office discusses

Problems with stopover flight plans

A STOPOVER FLIGHT plan like some marriages is "for better or for worse, but not for lunch." In other words, use this operational flight planning advantage when it suits the mission. Don't use it if your ground time requirements are uncertain.

Field reports indicate a continuing problem with "stopover" flight plans. For the most part, problems appear to be pilot-induced through lack of understanding of the ATC/FSS systems and/or the DD Form 175 instructions contained in DOD FLIP Planning II. Some problems are generated in either the military dispatch office or Flight Service Station along the way. The latter, usually in more remote areas with little military traffic. Study of the following points and references should be helpful.

Questions on the DD Form 175 instructions generally evolve because of the seeming redundancies of the enroute and remarks sections. This is a system requirement generated by those elements of information which are handled by ATC facilities and those by the FSS system. Detailed instructions on flight plan handling by military base operation offices are found in AR 95-11. FSS responsibilities are detailed in FAA Handbook 7110.10B, chapter 8, section 4. Pilot instructions in filing and follow-on communication requirements are outlined in FLIP Planning II under Preflight (I, B16 and IF 3, 4 and 5). In general, route information goes to the ARTCC data bank for dissemination to enroute and terminal agencies and becomes the basis for IFR flight handling. Remarks in the flight plan such as passenger and cargo codes, void time and stopover points are used exclusively by the FSS system in their flight-following role.

Once the planning is completed the pilot must continue working to make it fly without hitches. Start at the operations desk when you file your plan by making sure the dispatcher understands what you are planning to do and need in the way of services. You may even want to phone ahead to intermediate stops to ensure servicing or other delays will not exceed the authorized ground time. When airborne, communications required prior to each stop are critical. The minimum requirement as outlined in FLIP says contact FSS 45 minutes before your proposed ETD from the stopover point. If you wait until you are on the ground to advise the local FSS of your onward clearance request, you may find the tower has done you a "favor" and notified FSS of your downtime and you've been closed out. Experience has shown it best to advise the appropriate FSS serving each intermediate stop prior to landing of your intentions and requirements. You may also lose your plan for latter legs of a stopover plan if you fail to extend the "VOID" time when enroute delays (headwinds or holds) accumulate.

To ensure retention of flight-following and transmittal of other remarks, the servicing FSS must always be advised after each departure along the route from civil airfields. Only at military bases will this be accomplished by dispatcher/tower personnel.

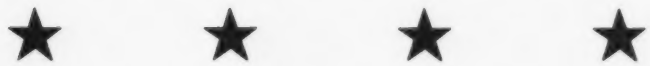
USAASO Sez: Be professional. Flap with the FLIP. Don't stop doing your planning thing with stopover intentions.

OPMS

Under the OPMS concept, each officer is expected to develop skills in two specialties. One in his basic entry specialty and the other in his designated alternate specialty. The objective is to ensure that an officer receives assignments and schooling which will enable him to attain the professional development necessary for his specialties. This will assure that we develop, advance and retain officers with the skills so critical to the management of Today's Army. We will have a system which recognizes the importance and contribution of officers in all specialty fields. In addition, OPMS will provide evidence of the equal opportunities for advancement in career fields other than the traditional command oriented assignment patterns. To stress this point, I personally emphasize OPMS in my orientation to all officer promotion boards.

Successful implementation of OPMS will depend in large measure on each officer realizing its importance and readjusting his own thinking concerning the traditional value system within the Officer Corps. However, they will only become convinced when they see the system actually work. I want the Officer Corps to know that I am fully behind OPMS and intend to see it work.

HOWARD H. CALLAWAY
Secretary of the Army



THE DIGEST has received numerous questions concerning the Officer Personnel Management System. Personnel in the Officers Division, Deputy Chief of Staff for Personnel (DCSPER) at the Department of the Army have researched the questions and provided us with answers. Thanks to their conscientious efforts, the DIGEST beginning next month will carry an "OPMS Questions and Answers" feature.

If you have a question, send it to us at: AVIATION DIGEST, P. O. Drawer P, Fort Rucker, AL 36360. If we already have the answer we will send it to you immediately. If not, we will get your answer as soon as possible.

5 USAAAVS OF 12

This is the fifth of 12 back covers designed to show personal survival, rescue and protective equipment. Detach each cover for a bulletin board display of the more important survival and protective equipment available to crewmembers in the field.

VEST TYPE SURVIVAL KIT (SRU-21/A) AND COMPONENTS

1. DA Technical Manual 55-8465-215-10, "Operator's Manual for Vest, Survival, SRU-21/P, Hot Climate."

2. Survival Kit, Individual (SRU-21/P), Vest Type: Complete with components: NSN 8465-00-177-4819, Line Item No. U72733, CTA 50-900. Without components: NSN 8415-00-177-4818.

3. Survival Kit, Individual, Tropical, NSN 6545-00-782-6412.

4. Tourniquet, NSN 6515-00-383-0565.

5. Net, gill, fishing, NSN 4240-00-300-2138.

6. Bag, Water (Size B), NSN 8465-00-634-4499.

*7. Revolver, .38 caliber, NSN 1005-00-835-9773.

*8, 9. Cartridge, caliber .38, Special Ball M-41, NSN 1305-00-322-6391.

10. Compass, magnetic, card, pocket, NSN 6605-00-515-5637. (Replaces lensatic compass, FSN 6605-846-7618.)

11. Mirror, Emergency, Signaling, Type I, NSN 6350-00-105-1252.

12, 13. Signal Kit, Foliage Penetrating, NSN 1370-00-490-7362.

14. Fire Starter, Butane Lighter, NSN 9920-00-999-6753.

15. Knife, Pocket, NSN 5110-00-162-2205.

16. Flash Guard, NSN 6230-00-401-2285.

17. Light, Marker Distress, SDU-5/E, NSN 6230-00-938-1778.

*18. Radio, Receiver–Transmitter, AN/PRC-90, with ½ wave length antenna, NSN 5820-00-782-5308.

*Items are not supplied with the vest. They are procured in accordance with TOE/MTOE/TDA/MTDA.